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Contents

An asterisk* indicates a peer-reviewed paper

Front cover: *Ramalina fastigiata*, on a tree at East Keswick, which disappeared from most of Yorkshire during the past two centuries due to atmospheric pollution (see page 81). Photo: Margaret Moseley.

The Naturalist

Checklist of Yorkshire lichens and lichenicolous fungi

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Although only 13 years have elapsed since the publication of the previous checklist (Seaward 2008), the continued high level of lichenological activity in the county has resulted in 81 new county records and a significant increase in 10 km x 10 km grid square records for the British Lichen Society Mapping Scheme. There has also been an unparalled number of changes to lichen nomenclature, particularly at the generic level.

Lichenology undertaken at field meetings of the YNU has been duly reported in *The Naturalist*, but the loss of a key field worker, Albert Henderson, in 2018 has had serious consequences in this respect; not only was he responsible for most of these lichenological reports, but his many authored and co-authored papers in *The Naturalist* over the past 40 years reflected his breadth of knowledge and interests (Seaward 2018). Fortunately, work on Yorkshire lichens has, nevertheless, continued in the hands of several enthusiasts, despite an inability to undertake fieldwork in recent months due to the corona virus. Of particular note is the work of Allan Pentecost in the Malham area as a consequence of the annual field courses he runs at the Field Studies Council Centre, and of Sue and Les Knight mainly in the northwest of the county. A BLS field meeting centred on the North Yorks Moors was held in 2016 (Price & Powell 2017), and this was followed by annual BLS workshops based at Cober Hill near Scarborough run at different times by Brian Coppins, Mark Powell and Neil Sanderson, and in 2017 the Malham Field Centre hosted a BLS workshop and field meeting (Pentecost *et al*. 2017). Some attempt has also been made by the author to supplement the outstanding work undertaken by Don Smith from 1982 to 2011 to survey the lichen flora of the enormous number of churches and their churchyards in the county (Henderson 2012); more recently, this work has been extended to survey cemeteries, such as Lawnswood in Leeds (Seaward 2014).

Special attention has also been paid to monitoring changes in the lichen flora due to quantitative and qualitative changes in atmospheric pollution, especially in respect of the West Yorkshire conurbation (Seaward 2010, 2016). The return or spread of taxa formerly uncommon, or indeed absent, for many years, such as *Ramalina* species (e.g. Cook 2019), have clearly benefitted

as a result of atmospheric amelioration (see front cover). Fieldwork by numerous recorders (mainly by those listed in Acknowledgements) has been supplemented by herbarium work and literature surveys, more particularly by the author who has also abstracted Yorkshire lichen records from papers which have appeared in *The Lichenologist*, and from regular lists of new and interesting lichens published in the *Bulletin of the British Lichen Society*; further sources of published Yorkshire records used in the production of this revision not listed in Seaward (1987, 1994, 2008) are provided below, including the innovative work by Pearson (2020) on the use of DNA metabarcoding to study the diet, including lichens (9 determined to species level), of two moths.

This latest checklist enumerates **989** taxa, **886** of which are consistently or facultatively lichenized fungi (**863** species, **3** subspecies, **15** varieties and **5** forms) and **103** are lichenicolous and non-lichenized fungi. Of the **989** taxa recorded over the past 300 years, **78** are based on old records, most of which are presumed extinct; of the **911** extant taxa, **386** have been newly discovered since 1956. Very few of the listed 'excluded taxa' in Seaward (1994, 2008) have been resolved, and some additional taxa in this category, including 16 in the actual checklist of Seaward (2008), appear at the end of the checklist below.

The checklist is based to some extent on the nomenclature of Smith *et al*. (2009) and Hawksworth (2003), but there have been a considerable number of changes at the generic level (particularly in respect of *Arthonia*, *Aspicilia*, *Caloplaca*, *Lecanora*, *Collema*, *Leptogium* and *Pertusaria*). Those taxa still extant in the county (**bolder type**) or have disappeared from it (lighter type), many of which are presumed extinct, are indicated. The numbers after each entry refer to the number of 10 km x 10 km grid squares (maximum 195) in which the taxon occurs, followed by the number from which it has disappeared (given in parentheses). The level of extinction, of considerable importance to conservation studies, can therefore be determined from these figures, but for many species our knowledge is imperfect; therefore, in a few cases, these figures have been highlighted to exemplify under-recorded (*) and over-recorded (**) taxa through taxonomic misapplication in the past or recent taxonomic segregation demanding reinterpretation of records for which limited herbarium material exists. Entries indicated as [LF] refer to 87 species (83 recent & 4 old records) of lichenicolous fungi and as [F] refer to 16 species (recent records) of non-lichenized fungi which are traditionally studied by lichenologists but often overlooked by mycologists; however, due to insufficient distributional data, no calculations relating to the status of these 103 species in 10 km x 10 km grid squares have been attempted.

Absconditella trivialis **(Willey ex Tuck.) Vězda 1(0)**
Abrothallus parmeliarum **(Sommerf.) Arnold [LF]**
Acarospora cervina **A. Massal. 7(0)**
A. fuscata **(Schrad.) Th. Fr. 185(0)**
A. glaucocarpa **(Ach.) Körb. 20(2)**
A. impressula **Th. Fr. 4(1)**
A. macrospora **(Hepp) A. Massal. ex Bagl. 2(4)**
A. nitrophila **H. Magn. 1(0)**
A. sinopica (Wahlenb.) Körb. 0(2)
A. umbilicata **Bagl. 21(0)**
A. veronensis **A. Massal. 4(3)**
Acolium inquinans **(Sm.) A. Massal. 4(6)**
A. sessile (Pers.) Arnold [LF]
Acrocordia conoidea **(Fr.) Körb. 33(5)**
A. gemmata **(Ach.) A. Massal. 7(6)**
A. salweyi **(Leight. ex Nyl.) A.L. Sm. 18(1)**
Adelococcus alpestris **(Zopf) Theiss. & Syd. [LF]**
Agonimia allobata **(Stizenb.) P. James 2(0)**
A. flabelliformis **J.P. Halda et al. 1(0)**
A. gelatinosa **(Ach.) M. Brand & Diederich 4(0)**
A. globulifera **M. Brand & Diederich 2(0)**

A. tristicula (Nyl.) Zahlbr. 54(0)
Agyrium rufum (Pers.) Fr. [F]
Alectoria nigricans (Ach.) Nyl. 1(1)
Alyxoria culmigera (Lib.) Ertz 17(7)
A. mougeotii (A. Massal.) Ertz et al. 4(2)
A. ochrocheila (Nyl.) Ertz & Tehler 21(0)
A. varia (Pers.) Ertz & Tehler 21(11)
A. viridipruinosa (Coppins & Yahr) Ertz 4(0)
Amandinea pelidna (Ach.) Fryday & Arcadia 1(0)
A. punctata (Hoffm.) Coppins & Scheid. 143(3)
Amygdalaria pelobotryon (Wahlenb.) Norman 2(1)
Anaptychia ciliaris Körb. ex A. Massal. 13(41)
A. runcinata (With.) J.R. Laundon 2(0)
Anisomeridium biforme (Borrer) R.C. Harris 9(5)
A. polypori (Ellis & Everh.) M.E. Barr 35(0)
A. ranunculospora Coppins & P. James 10(0)
A. viridescens (Coppins) R.C. Harris 1(0)
Arctoparmelia incurva (Pers.) Hale 35(1)
Aquacidia viridifarinosa (Coppins & P. James) Aptroot 8(0)
Arrhenia peltigerina (Peck) Redhead et al. [LF]
Arthonia apotheciorum (A. Massal.) Almq. [LF]
A. arthonioides (Ach.) A.L. Sm. 9(3)
A. atra (Pers.) A. Schneid. 31(8)
A. calcarea (Turner ex Sm.) Ertz & Diederich 84(6)
A. didyma Körb. 11(1)
A. intexta Almq. [LF]
A. lapidicola (Taylor) Branth & Rostr. 10(0)
A. ligniaria Hellb. 2(0)
A. ligniariella Coppins 1(0)
A. muscigena Th. Fr. 3(0)
A. parietinaria Hafellner & Fleischhacker 1(0) [LF]
A. phaeophysciae Grube & Matzer [LF]
A. pruinata (Pers.) Steud. ex A.L. Sm. 0(8)
A. radiata (Pers.) Ach. 64(10)
A. varians (Davies) Nyl. [LF]
A. vinosa Leight. 11(4)
Arthopyrenia analepta (Ach.) A. Massal. [F]
A. cinereopruinosa (Schaer.) A. Massal. [F]
A. fraxini A. Massal. [F]
A. nitescens (Salwey) Mudd 0(1)
A. punctiformis A. Massal. [F]
A. salicis A. Massal. 0(2)
Arthrorhaphis citrinella (Ach.) Poelt [LF]
A. grisea Th. Fr. [LF]
A. muddii Obermayer [LF]
Aspicilia caesiocinerea (Nyl. ex Malbr.) Arnold 17(1)
A. calcarea (L.) Körb. 122(2)
A. cinerea (L.) Körb. [s.lat.] 16(8)
A. contorta (Hoffm.) Kremp. subsp. *contorta* 117(1)
subsp. *hoffmanniana* S. Ekman & Fröberg 17(0)*
A. grisea Arnold 1(0)
A. intermutans (Nyl.) Arnold 0(1)
A. laevata (Ach.) Arnold 3(1)
A. radiosa (Hoffm.) Poelt & Leuckert 7(4)
A. recedens (Taylor) Arnold 0(1)
Athelia arachnoidea (Berk.) Jülich [LF]
Atla wheldonii (Travis) Savić & Tibell 1(0)

Bachmanniomyces uncialicola (Zopf) D. Hawksw. [LF]
Bacidia arceutina (Ach.) Arnold 7(3)
B. bagliettoana (A. Massal. & de Not.) Jatta 13(7)
B. friesiana (Hepp) Körb. 2(0)
B. fuscoviridis (Anzi) Lettau 4(0)
B. laurocerasi (Delise ex Duby) Zahlbr. 0(11)
B. rubella (Hoffm.) A. Massal. 12(15)
Bacidina adastra (Sparrius & Aptroot) M. Hauck & V. Wirth 8(0)
B. arnoldiana (Körb.) V. Wirth & Vězda 34(0)
B. caligans (Nyl.) Llop & Hladún 11(0)
B. chloroticula (Nyl.) Vězda & Poelt 7(0)
B. delicata (Larbal. ex Leight.) V. Wirth & Vězda 6(0)
B. egenula (Nyl.) Vězda 3(0)
B. inundata (Fr.) Vězda 20(2)
B. modesta (Zwackh ex Vain.) S. Ekman 4(0)
B. neosquamulosa (Aptroot & van Herk) S. Ekman 2(0)*
B. phacodes (Körb.) Vězda 0(2)
B. saxenii (Erichsen) M. Hauck & V. Wirth 8(0)
Bactrospora corticola (Fr.) Almq. 1(0)
Baeomyces placophyllus Ach. 6(0)
B. rufus (Huds.) Rebent. 99(9)
Bellicidia incompta (Borrer) Kistenich et al. 4(6)
Belonia nidarosiensis (Kindt) P.M. Jørg. & Vězda 70(0)
Biatoridium monasteriensis J. Lahm ex Körb. 0(1)
Bilimbia lobulata (Sommerf.) Hafellner & Coppins 11(3)
B. sabuletorum (Schreb.) Arnold 112(3)

Blennothallia crispa (Huds.) Otálora et al. 98(6)
Botryolepraria lesdanii (Hue) Canals et al. 23(0)*
Brianaria bauschiana (Körb.) S. Ekman & M. Svenss. 20(2)
B. lutulata (Nyl.) S. Ekman & M. Svenss. 2(2)
B. sylvicola (Flot. ex Körb.) Vězda & V. Wirth 8(3)
B. tuberculata (Sommerf.) S. Ekman & M. Svenss. 1(0)
Bryobilimbia hypnorum (Lib.) Fryday et al. 6(1)
Bryoria bicolor (Ehrh.) Brodo & D. Hawksw. 0(9)
B. chalybeiformis (L.) Brodo & D. Hawksw. 2(6)
B. fuscescens (Gyeln.) Brodo & D. Hawksw. 39(15)
B. subcana (Nyl.ex Stizenb.) Brodo & D. Hawksw. 2(2)
Buellia aethalea (Ach.) Th. Fr. 121(0)
B. disciformis (Fr.) Mudd 2(6)
B. erubescens Arnold 1(0)
B. griseovirens (Turner & Borrer ex Sm.) Almb. 25(0)
B. ocellata (Flot.) Körb. 6(4)
B. pulverea Coppins & P. James 7(0)
B. schaereri De Not. 3(1)
B. stellulata (Taylor) Mudd 8(1)**
Bunodophoron melanocarpum (Sw.) Wedin 5(13)

Caeruleum heppii (Nägeli ex Körb.) K. Knudsen & Arcadia 17(3)
Calicium abietinum Pers. 0(4)
C. adspersum Pers. 0(1)
C. glaucellum Ach. 15(1)
C. notarisii (Tul.) M. Prieto & Wedin 0(1)
C. salicinum Pers. 0(4)
C. viride Pers. 48(9)
Callome multipartitum (Sm.) Otálora et al. 9(5)
Caloplaca albolutescens (Nyl.) H. Olivier 4(0)*
C. arcis (Poelt & Vězda) Arup 22(0)*
C. aurantia (Pers.) Hellb. 51(7)
C. austrocitrina Vondrák et al. 2(0)*
C. cerina (Ehrh. ex Hedw.) Th. Fr. 11(7)
C. cerinella (Nyl.) Flagey 10(0)
C. cerinelloides (Erichsen) Poelt 1(0)
C. chalybaea (Fr.) Müll. Arg. 13(0)
C. chlorina (Flot.) H. Olivier 101(0)
C. chrysodeta (Vain. ex Räsänen) Dombr. 51(0)
C. cirrochroa (Ach.) Th. Fr. 13(2)
C. citrina (Hoffm.) Th. Fr. 194(1) s.lat., incl. 33(0) s.str.
C. crenularia (With.) J.R. Laundon 52(8)
C. crenulatella (Nyl.) H. Olivier 25(1)*
C. dalmatica (Massal.) H. Olivier 11(0)
C. decipiens (Arnold) Blomb. & Forssell 125(2)
C. dichroa Arup 14(0)*
C. ferruginea (Huds.) Th. Fr. 0(3)
C. flavescens (Huds.) J.R. Laundon 156(1)
C. flavocitrina (Nyl.) H. Olivier 50(0)*
C. flavorubescens (Huds.) J.R. Laundon 1(5)
C. flavovirescens (Wulfen) Dalla Torre & Sarnth. 32(6)
C. herbidella (Hue) H. Magn. 1(0)
C. holocarpa (Hoffm.) A.E. Wade [s.lat.] 175(0)
C. limonia Nimis & Poelt 10(0)*
C. luteoalba (Turner) Th. Fr. 1(17)
C. marina (Wedd.) Zahlbr. ex Du Rietz 4(0)
C. maritima (B. de Lesd.) B. de Lesd. 1(0)
C. marmorata (Bagl.) Jatta 24(1)
C. oasis (A. Massal.) Szat. 14(0)*
C. obscurella (Lahm ex Körb.) Th. Fr. 10(0)
C. ochracea (Schaer.) Flagey 3(3)
C. phlogina (Ach.) Flagey 6(0)*
C. pollinii (A. Massal.) Jatta 0(1)
C. saxicola (Hoffm.) Nordin 131(5)
C. teicholyta (Ach.) J. Steiner 70(0)
C. thallincola (Wedd.) Du Rietz 1(0)
C. ulcerosa Coppins & P. James 3(0)
C. variabilis (Pers.) Müll. Arg. 23(0)
C. verruculifera (Vain.) Zahlbr. 1(0)
C. xantholyta (Nyl.) Jatta 17(3)
Calvitimela aglaea (Sommerf.) Hafellner 2(1)
Candelaria concolor (Dicks.) Stein 11(7)*
Candelariella aurella (Hoffm.) Zahlbr. f. *aurella* 184(1)
f. *smaragdula* Szatala 3(0)
C. coralliza (Nyl.) H. Magn. 15(0)
C. medians (Nyl.) A.L. Sm. f. *medians* 104(0)
f. *steepholmensis* O.L. Gilbert 1(0)
C. vitellina (Hoffm.) Müll. Arg. f. *vitellina* 193(0)
f. *flavovirella* (Nyl.) A. Henderson 10(0)
C. *xanthostigma* (Ach.) Lettau 19(0)
C. *xanthostigmoides* (Müll. Arg.) R.W. Rogers 62(0)
Carbonea supersparsa (Nyl.) Hertel [LF]
C. vitellinaria (Nyl.) Hertel [LF]
C. vorticosa (Flörke) Hertel 1(1)
Catapyrenium cinereum (Pers.) Körb. 0(2)

Catillaria atomarioides (Müll. Arg.) H. Kilias 3(0)*
C. chalybeia (Borrer) A. Massal. 123(2)
C. contristans (Nyl.) Zahlbr. 1(0)
C. lenticularis (Ach.) Th. Fr. 112(3)
C. nigroclavata (Nyl.) Schuler 1(0)
C. scotinodes (Nyl.) Coppins 1(0)
Celothelium ischnobelum (Nyl.) M.B. Aguirre 2(0)
Cercidiospora epipolytropa (Mudd) Arnold [LF]
Cetraria aculeata (Schreb.) Fr. 52(22)
C. islandica (L.) Ach. 13(24)
C. muricata (Ach.) Eckfeldt 37(8)
C. sepincola (Ehrh.) Ach. 1(2)
Chaenotheca brachypoda (Ach.) Tibell 2(2)
C. brunneola (Ach.) Müll. Arg. 4(3)
C. chlorella (Ach.) Müll. Arg. 1(0)
C. chrysocephala (Turner ex Sm.) Th. Fr. 3(3)
C. ferruginea (Turner ex Sm.) Mig. 65(1)
C. furfuracea (L.) Tibell 12(1)
C. gracilenta (Ach.) Mattsson & Middelb. 2(0)
C. hispidula (Ach.) Zahlbr. 2(3)
C. phaeocephala (Turner) Th. Fr. 0(2)
C. stemonea (Ach.) Müll. Arg. 3(4)
C. trichialis (Ach.) Th. Fr. 7(1)
Chaenothecopsis debilis (Sm.) Tibell [F]
C. nigra Tibell 1(0)
C. pusilla (Ach.) A.F.W. Schmidt [LF]
Chrysothrix candelaris (L.) J.R. Laundon 36(3)
C. flavovirens Tønsberg 1(0)
Cladonia arbuscula subsp. *squarrosa* (Wallr.) Ruoss 21(17)
C. bellidiflora (Ach.) Schaer. 9(4)
C. borealis S. Stenroos 0(1)
C. caespiticia (Pers.) Flörke 9(2)
C. callosa Delise ex Harm. 5(0)
C. cariosa (Ach.) Spreng. 5(3)
C. cervicornis (Ach.) Flot. 29(10)
C. chlorophaea (Flörke ex Sommerf.) Spreng. [s.lat.] 135(1)
C. ciliata Stirt. var. *ciliata* 5(1)
var. *tenuis* (Flörke) Ahti 19(3)
C. coccifera (L.) Willd. [s.lat.] 89(11)**
C. coniocraea (Flörke) Spreng. 153(0)
C. cornuta (L.) Hoffm. 3(2)
C. crispata var. *cetrariiformis* (Delise ex Duby) Vain. 21(4)
C. cyathomorpha Stirt. ex Walt. Watson 4(0)
C. digitata (L.) Hoffm. 37(11)
C. diversa Asperges 31(0)*
C. fimbriata (L.) Fr. 159(2)
C. firma (Nyl.) Nyl. 1(0)
C. floerkeana (Fr.) Flörke 78(4)
C. foliacea (Huds.) Willd. 4(8)
C. furcata (Huds.) Schrad. subsp. *furcata* 78(9)
subsp. *subrangiformis* Sandst. 8(0)
C. glauca Flörke 9(1)
C. gracilis (L.) Willd. 21(16)**
C. humilis (With.) J.R. Laundon 49(5)
C. incrassata Flörke 1(0)
C. luteoalba Wheldon & A. Wilson 29(0)
C. macilenta Hoffm. 121(8)
C. ochrochlora Flörke 19(7)
C. parasitica (Hoffm.) Hoffm. 12(2)
C. pleurota (Flörke) Schaer. 2(1)*
C. pocillum (Ach.) Grognot 65(4)
C. polydactyla (Flörke) Spreng. var. *polydactyla* 92(6)
var. *umbricola* (Tønsberg & Ahti) Coppins 1(0)
C. portentosa (Dufour) Coem. 63(6)
C. pyxidata (L.) Hoffm. 71(5)
C. ramulosa (With.) J.R. Laundon 39(2)
C. rangiformis Hoffm. 45(5)
C. rei Schaer. 1(0)
C. scabriuscula (Delise) Nyl. 9(2)
C. squamosa (Scop.) Hoffm. 83(10) s.lat., incl. 10(0)* s.str.
var. *subsquamosa* (Nyl. ex Leight.) Vain. 21(7)
C. strepsilis (Ach.) Grognot 2(2)
C. subcervicornis (Vain.) Kernst. 39(0)
C. subulata (L.) F.H. Wigg. 59(9)
C. sulphurina (Michx.) Fr. 4(2)
C. uncialis subsp. *biuncialis* (Hoffm.) M. Choisy 39(23)
C. verticillata (Hoffm.) Ahti 12(3)
C. zopfii Vain. 0(4)
Clauzadea chondrodes (A. Massal.) Clauzade & Cl. Roux 1(0)
C. immersa (Hoffm.) Hafellner & Bellem. 22(11)
C. metzleri (Körb.) Clauzade & Cl. Roux ex D. Hawksw. 7(1)
C. monticola (Ach.) Hafellner & Bellem. 68(5)
Cliostomum corrugatum (Ach.) Fr. 0(7)
C. griffithii (Sm.) Coppins 95(0)
C. subtenerum Coppins & Fryday 1(0)

Coenogonium luteum (Dicks.) Kalb & Lücking 2(0)
C. pineti (Ach.) Vězda 53(1)
Collema flaccidum (Ach.) Ach. 11(6)
C. furfuraceum (Arnold) Du Rietz 2(2)
C. nigrescens (Huds.) DC. 0(5)
C. subflaccidum Degel. 4(3)
Collemopsidium arenisedum (A.L. Sm.) Coppins & Aptroot 1(0)
C. caesium (Nyl.) Coppins & Aptroot 1(0)
C. halodytes (Nyl.) Grube & B.D. Ryan [s.lat.] 12(0)
C. monense (Wheldon) Coppins & Aptroot 5(0)
C. sublitorale (Leight.) Grube & B.D. Ryan 1(2)
Coniocarpon cinnabarina DC. 4(9)
C. cuspidans (Nyl.) Moen et al. 3(1)
Cornicularia normoerica (Gunn.) Du Rietz 1(5)
Corticifraga peltigerae (Fuckel) D. Hawksw. & R. Sant. [LF]
Cresponea premnea (Ach.) Egea & Torrente 0(7)
Cryptodiscus gloeocapsa (Nitschke ex Arnold) Baloch et al. 4(0)
Cyrtidula hippocastani (DC.) R.C. Harris [F]
C. quercus (A. Massal.) Minks. [F]
Cystocoleus ebeneus (Dillwyn) Thwaites 17(8)

Dacampia rufescentis (Vouaux) D. Hawksw. [LF]
Dactylospora athallina (Müll. Arg.) Hafellner [LF]
D. parasitica (Flörke ex Spreng.) Zopf [LF]
Dendrographa decolorans (Turner & Borrer) Ertz & Tehler 21(0)
Dermatocarpon intestiniforme (Körb.) Hasse 1(0)
D. luridum (With.) J.R. Laundon 7(5)
D. miniatum (L.) W. Mann 34(7)
Diarthonis spadicea (Leight.) Frisch et al. 37(0)
Dibaeis baeomyces (L. f.) Rambold & Hertel 24(8)
Didymellopsis pulposi (Zopf) Grube & Hafellner [LF]
Diploicia canescens (Dicks.) A. Massal. 119(9)
Diploschistes gypsaceus (Ach.) Zahlbr. 1(2)
D. muscorum (Scop.) R. Sant. 24(1)
D. scruposus (Schreb.) Norman 46(11)
Diplotomma alboatrum (Hoffm.) Flot. 115(3)
D. hedinii (H. Magn.) P. Clerc & Cl. Roux 7(13)
D. pharcidium (Ach.) M.Choisy 0(1)
Dirina massiliensis f. *sorediata* (Müll. Arg.) Tehler 55(0)

Eiglera flavida (Hepp) Hafellner 6(2)
Enchylium bachmanianum (Fink) Otálora et al. 1(2)
E. limosum (Ach.) Otálora et al. 5(6)
E. polycarpon (Hoffm.) Otálora et al. 6(7)
E. tenax (Sw.) Gray var. tenax 75(15)
var. *ceranoides* (as *Collema tenax* var. *ceranoides* (Borrer) Degel.) 44(5)
var. *vulgare* (as *Collema tenax* var. *vulgare* (Schreb.) Degel.) 8(2)
Endocarpon pusillum Hedw. 1(0)
Endococcus caudisporus J.C. David & Etayo [LF]
E. perpusillus Nyl. [LF]
E. propinquus (Kőrb.) D. Hawksw. [LF]
E. pseudocarpus Nyl. [LF]
E. regulosus Nyl. [LF]
Enterographa crassa (DC.) Fée 16(8)
E. hutchinsiae (Leight.) A. Massal. 3(2)
E. zonata (Körb.) Källsten ex Torrente & Egea 13(1)
Epicladonia stenospora (Harm.) D. Hawksw. [LF]
Epigloea soleiformis Döbbeler 1(0)
Epilichen scabrosus (Ach.) Clem. [LF]
Erythricium aurantiacum (Lasch) D. Hawksw. & A. Henrici [LF]
Euopyrenula grandicula Coppins 1(0)
Evernia prunastri (L.) Ach. 137(4)

Farnoldia jurana (Schaer.) Hertel 12(1)
Fellhanera bouteillei (Desm.) Vězda 1(0)
F. ochracea Sparrins & Aptroot 2(0)
F. subtilis (Vězda) Diederich & Sérus. 1(0)
Fellhaneropsis vezdae (Coppins & P. James) Sérus. & Coppins 19(0)
Flavoparmelia caperata (L.) Hale 49(22)
F. soredians (Nyl.) Hale 9(0)
Fuscidea cyathoides (Ach.) V. Wirth & Vězda var. *cyathoides* 57(3)
var. *sorediata* (H. Magn.) Poelt 1(0)
F. gothoburgensis (H. Magn.) V.Wirth & Vězda 1(0)
F. intercincta (Nyl.) Poelt 1(0)
F. kochiana (Hepp) V. Wirth & Vězda 15(5)
F. lightfootii (Sm.) Coppins & P. James 28(2)*
F. lygaea (Ach.) V. Wirth & Vězda 12(4)
F. praeruptorum (Du Rietz & H. Magn.) V. Wirth & Vězda 24(0)

F. recensa (Stirt.) Hertel et al. 3(0)

Graphis elegans (Borrer ex Sm.) Ach. 32(11)
G. inustuloides Lücking 5(9)
G. scripta (L.) Ach. 46(14)
Graphium aphthosae Alstrup & D. Hawksw. [LF]
Gyalecta flotowii Körb. 3(1)
G. foveolaris (Ach.) Schaer. 1(3)
G. geoica (Wahlenb.) Ach. 1(1)
G. jenensis (Batsch) Zahlbr. 40(11)
G. truncigena (Ach.) Hepp 6(2)
G. ulmi (Sw.) Zahlbr. 1(5)
Gyalidea fritzei (Stein) Vězda 1(0)
G. lecideopsis (Massal.) Lettau ex Vězda 1(0)
Gyrographa gyrocarpa (Flot.) Ertz & Tehler 42(0)

Haematomma ochroleucum (Neck.) J.R. Laundon var. *ochroleucum* 82(7)
var. *porphyrium* (Pers.) J.R. Laundon 74(0)
Halecania viridescens Coppins & P. James 3(0)
Henrica melaspora (Taylor) Savić & Tibell 1(0)
Herteliana gagei (Sm.) J.R. Laundon 0(2)
Heterocephalacria physciacearum (Diederich) Millanes & Wedin [LF]
Hydropunctaria maura (Wahlenb.) C. Keller et al. 6(3)
H. rheitrophila (Zschacke) C. Keller et al. 6(1)
H. scabra (Vězda) C. Keller et al. 2(0)
Hymenelia epulotica (Ach.) Lutzoni 9(3)
H. heteromorpha (Kremp.) Lutzoni 1(0)
H. prevostii (Duby) Kremp. 18(1)
Hyperphyscia adglutinata (Flörke) H. Mayrhofer & Poelt 10(2)*
Hypocenomyce scalaris (Ach. ex Lilj.) M. Choisy 101(3)
Hypogymnia physodes (L.) Nyl. 159(2)
H. tubulosa (Schaer.) Hav. 115(0)
Hypotrachyna afrorevoluta (Krog & Swinscow) Krog & Swinscow 12(0)*
H. laevigata (Sm.) Hale 2(4)
H. revoluta (Flörke) Hale 36(3) s.lat., incl. 5(0) s.str.

Icmadophila ericetorum (L.) Zahlbr. 3(9)
Illosporiopsis christiansenii (B.L. Brady & D. Hawksw.) D. Hawksw. [LF]
Illosporium carneum Fr. [LF]
Immersaria anthroocarpa (Ach.) Rambold & Pietschm. 1(0)
Imshaugia aleurites (Ach.) S.L.F. Mey. 3(7)
Ionaspis lacustris (With.) Lutzoni 28(2)

Jamesiella anastomosans (P. James & Vězda) Lücking et al. 14(0)

Laetisaria lichenicola Diederich et al. [LF]
Lambiella furvella (Nyl. ex Mudd) M. Westb. & Resl 8(0)
L. insularis (Nyl.) T. Sprib. 0(2)
Lasallia pustulata (L.) Mérat 3(2)
Lathagrium auriforme (With.) Otálora et al. 63(0)
L. cristatum (L.) Otálora et al. 25(12)
var. *marginale* (Huds.) Cl. Roux 1(3)*
L. fuscovirens (With.) Otálora et al. 29(7)
L. undulatum (Laurer ex Flot.) Poetsch 6(2)
Lecanactis abietina (Ach.) Körb. 53(4)
L. dilleniana (Ach.) Körb. 2(1)
L. subabietina Coppins & P. James 3(0)
Lecania atrynoides M. Knowles 2(0)
L. baeomma (Nyl.) P. James & J.R. Laundon 2(0)
L. chlorotiza (Nyl.) P. James 2(0)
L. coeruleorubella (Mudd) M. Mayrhofer 0(1)
L. coerulescens Mudd 0(1)
L. cuprea (A. Massal.) van den Boom & Coppins 6(2)
L. cyrtella (Ach.) Th. Fr. 51(1)
L. cyrtellina (Nyl.) Sandst. 9(2)
L. erysibe (Ach.) Mudd [s.lat.] 161(0)
L. hutchinsiae (Nyl.) A.L. Sm. 10(0)
L. inundata (Hepp ex Körb.) M.Mayrhofer 9(0)*
L. naegelii (Hepp) Diederich & van den Boom 15(1)
L. nylanderiana A. Massal. 1(3)
L. subfuscula (Nyl.) S. Ekman 2(0)
L. sylvestris (Arnold) Arnold 1(0)
L. turicensis (Hepp) Müll. Arg. 22(0)
Lecanographa amylacea (Ehrh. ex Pers.) Egea & Torrente 0(1)
L. lyncea (Sm.) Fr. 1(8)
Lecanora aitema (Ach.) Hepp 8(1)
L. albella (Pers.) Ach. 3(4)
L. albellula (Nyl.) Th. Fr. 2(1)
L. argentata (Ach.) Malme 4(0)
L. caesiosora Poelt 36(0)
L. campestris (Schaer.) Hue subsp. *campestris* 167(1)

subsp. *dolomitica* O.L. Gilbert 10(0)
L. carpinea (L.) Vain. 33(4)
L. chlarotera Nyl. 124(10)
L. compallens Herk & Aptroot 11(0)*
L. confusa Almb. 8(0)
L. conizaeoides Nyl. ex Cromb. 195(0)**
L. epanora (Ach.) Ach. 14(3)
L. epibryon (Ach.) Ach. 1(1)
L. expallens Ach. 145(2)
L. gangaleoides Nyl. 35(1)
L. handelii J. Steiner 7(0)*
L. helicopis (Wahlenb.) Ach. 1(1)
L. horiza (Ach.) Linds. 5(0)*
L. hybocarpa (Tuck.) Brodo 1(0)*
L. intricata (Ach.) Ach. 104(0)
L. intumescens (Rebent.) Rabenh. 0(2)
L. muralis (Schreb.) Rabenh. 184(0)
L. orosthea (Ach.) Ach. 122(0)
L. pannonica Szatala 31(0)
L. polytropa (Hoffm.) Rabenh. 190(0)
L. pulicaris (Pers.) Ach. 26(3)
L. rupicola (L.) Zahlbr. var. *rupicola* 68(4)
var. *efflorens* Leuckert & Poelt 4(0)
L. saligna (Schrad.) Zahlbr. 48(8)
L. sarcopidoides (A. Massal.) Hedl. 1(0)
L. soralifera (Suza) Räsänen 165(0)
L. stenotropa Nyl. 30(0)
L. subaurea Zahlbr. 9(0)
L. subcarnea (Lilj.) Ach. 1(2)
L. sublivescens (Nyl.) A.L. Sm. 1(0)
L. sulphurea (Hoffm.) Ach. 110(2)
L. symmicta (Ach.) Ach. 53(9)
L. varia (Hoffm.) Ach. 17(8)**
Lecidea commaculans Nyl. 1(0)
L. confluens (Weber) Ach. 2(14)**
L. diducens Nyl. 1(0)
L. erythrophaea Flörke 0(3)
L. fuliginosa Taylor 0(1)
L. fuscoatra (L.) Ach. 135(1) s.lat., incl. 2(0)* s.str.
L. grisella Flörke 23(0)*
L. hypopta Ach. 2(0)
L. lactea Flörke ex Schaer. [s.lat.] 2(3)
L. lapicida (Ach.) Ach. 4(8)
L. lithophila (Ach.) Ach. 33(14)
L. obluridata Nyl. 1(0)
L. plana (J. Lahm) Nyl. 12(7)
L. promixta Nyl. 1(0)
L. silacea (Ach.) Ach. 0(2)
L. turgidula Fr. 0(2)
Lecidella asema (Nyl.) Knoph & Hertel 2(2)
L. carpathica Körb. 13(0)*
L. elaeochroma (Ach.) M. Choisy f. *elaeochroma* 95(10)
f. *soralifera* (Erichsen) D. Hawksw. 3(0)
L. scabra (Taylor) Hertel & Leuckert 175(0)
L. stigmatea (Ach.) Hertel & Leuckert 172(1)
Lecidoma demissum (Rutstr.) Gotth. Schneid. & Hertel 0(4)
Lemmopsis arnoldiana (Hepp) Zahlbr. 1(0)
Lempholemma botryosum (A. Massal.) Zahlbr. 5(0)
L. cladodes (Tuck.) Zahlbr. 6(0)
L. polyanthes (Bernh.) Malme 15(2)
Lepra albescens (Huds.) Hafellner 43(6)
var. *corallina* (as *Pertusaria albescens* var. *corallina* (Zahlbr.) J.R. Laundon) 65(3)
L. amara (Ach.) Hafellner 91(9)
L. aspergilla (Ach.) Hafellner 31(3)**
L. corallina (L.) Hafellner 64(5)
L. multipuncta (Turner) Hafellner 8(4)
Lepraria caesioalba (de Lesd.) J.R. Laundon 42(0)
L. diffusa (J.R. Laundon) Kukwa 1(1)
L. eburnea J.R. Laundon 2(1)
L. ecorticata (J.R. Laundon) Kukwa 1(0)
L. elobata Tønsberg 2(0)
L. finkii (B. de Lesd.) R.C. Harris 52(0)*
L. incana (L.) Ach. 194(0)** s.lat., incl. 32(0)* s.str.
L. membranacea (Dicks.) Vain. 6(0)*
L. nivalis J.R. Laundon 13(0)
L. rigidula (Hue) Tønsberg 1(0)
L. umbricola Tønsberg 1(0)
L. vouauxii (Hue) R.C. Harris 80(0)*
Leprocaulon microscopicum (Vill.) Gams ex D. Hawksw. 0(2)
Leptorhaphis epidermidis (Ach.) Th. Fr. [F]
Lichenoconium erodens M.S. Christ & D. Hawksw. [LF]
L. lecanorae (Jaap) D. Hawksw. [LF]
L. xanthoriae M.S. Christ. [LF]
Lichenodiplis lecanorae (Vouaux) Dyko & D. Hawksw. [LF]
Lichenomphalia alpina (Britzelm.) Redhead et al. 1(0)
L. hudsoniana (H.S. Jenn.) Redhead et al. 17(7)
L. umbellifera (L.) Redhead et al. 19(5)

L. velutina (Quél.) Redhead et al. 2(0)
Lichenotubeufia heterodermiae (Etayo) Etayo [LF]
Lichina confinis (O.F. Müll.) C. Agardh 2(0)
L. pygmaea (Lightf.) C. Agardh 1(1)
Lithographa tesserata (DC.) Nyl. 1(2)
Lobaria amplissima (Scop.) Forssell 1(5)
L. pulmonaria (L.) Hoffm. 2(28)
L. scrobiculata (Scop.) DC. 0(10)
L. virens (With.) J.R. Laundon 0(16)
Loxospora elatina (Ach.) A. Massal. 4(0)

Marchandiomyces corallinus (Roberge) Diederich & D. Hawksw. [LF]
Megalaria grossa (Pers. ex Nyl.) Hafellner 0(17)**
M. pulverea (Borrer) Hafellner & E. Schreiner 0(1)
Megaspora verrucosa (Ach.) Hafellner & V. Wirth 4(2)
Melanelixia fuliginosa (Fr. ex Duby) O. Blanco et al. 128(2)
M. glabratula (Lamy) Sandler & Arup 123(2)
M. subaurifera (Nyl.) O. Blanco et al. 124(0)
Melanohalea elegantula (Zahlbr.) O. Blanco et al. 13(0)
M. exasperata (De Not.) O. Blanco et al. 5(6)
M. exasperatula (Nyl.) O. Blanco et al. 32(0)
M. laciniatula (H. Olivier) O. Blanco et al. 8(0)
Merismatium deminutum (Arnold) Cl. Roux & Nav.-Ros. 10(2)
M. discrepans (J. Lahm) Triebel [LF]
Micarea adnata Coppins 1(0)
M. botryoides (Nyl.) Coppins 33(0)
M. cinerea (Schaer.) Hedl. 2(0)
M. coppinsii Tønsberg 4(0)
M. denigrata (Fr.) Hedl. 75(0)
M. doliiformis (Coppins & P. James) Coppins & Sérus. 1(0)
M. erratica (Körb.) Hertel et al. 18(3)
M. leprosula (Th. Fr.) Coppins & A. Fletcher 9(1)
M. lignaria (Ach.) Hedl. 71(1)
M. lithinella (Nyl.) Hedl. 3(0)
M. lynceola (Th. Fr.) Palice 3(0)
M. melaena (Nyl.) Hedl. 37(2)
M. nitschkeana (J. Lahm ex Rabenh.) Harm. 16(1)
M. peliocarpa (Anzi) Coppins & R. Sant. 14(3)
M. polycarpella (Erichsen) Coppins & Palice 2(0)
M. prasina Fr. [s.lat.] 67(3)**
M. pseudomarginata Coppins 3(0)
M. pycnidiophora Coppins & P. James 3(0)
M. sambuci van den Boom et al. 1(0)
M. ternaria (Nyl.) Vězda 1(0)
M. viridileprosa van den Boom & Coppins 1(0)
Microcalicium ahlneri Tibell 1(0) [F]
M. arenarium (Hampe ex A. Massal.) Tibell [LF]
Miriquidica leucophaea (Rabenh.) Hertel & Rambold 27(4)
M. pycnocarpa (Körb.) Andreev f. *pycnocarpa* 4(1)
Moelleropsis nebulosa (Hoffm.) Gyeln. 1(1)
Muellerella erratica (A. Massal.) Hafellner & Volk. John [LF]
M. hospitans Stizenb. [LF]
M. lichenicola (Sommerf.) D. Hawksw. [LF]
M. pygmaea (Körb.) D. Hawksw. var. *pygmaea* [LF]
M. ventosicola (Mudd) D. Hawksw. [LF]
Mycobilimbia pilularis (Hepp ex Körb.) Hafellner & Türk 6(10)
Mycoblastus alpinus (Fr.) Kernst. 1(0)
M. caesius (Coppins & P. James) Tønsberg 4(0)
M. sanguinarius (L.) Norman 46(13)
Mycoporum antecellans (Nyl.) R.C. Harris [F]
M. lacteum (Ach.) R.C. Harris [F]
Myriolecis agardhiana (Ach.) Śliwa et al. 0(2)
M. albescens (Hoffm.) Śliwa et al. 173(3)
M. antiqua (J.R. Laundon) Śliwa et al. 71(0)
M. crenulata (Ach.) Śliwa et al. 109(6)
M. dispersa (Pers.) Śliwa et al. 194(0)
M. hagenii (Ach.) Śliwa et al. 24(0)*
M. invadens (H. Magn.) Śliwa et al. 1(0)
M. persimilis (Th. Fr.) Śliwa et al. 8(0)*
M. sambuci (Pers.) Clem. 2(2)
M. semipallida (H. Magn.) Śliwa et al. 11(0)*
M. zosterae (Ach.) Śliwa et al. 1(0)
Myriospora rufescens (Ach.) Nägeli 23(2)
M. smaragdula (Wahlenb.) Nägeli 62(8)

Naetrocymba saxicola (A. Massal.) R.C. Harris 3(3)
Naevia punctiformis (Ach.) A. Massal. [F]
Nephroma laevigatum Ach. 0(7)
Nesolechia oxyspora (Tul.) A. Massal. [LF]
Normandina pulchella (Borrer) Nyl. 7(4)

Ochrolechia androgyna (Hoffm.) Arnold 101(0)

O. frigida (Sw.) Lynge 13(3)
O. microstictoides Räsänen 4(0)*
O. parella (L.) A. Massal. 104(13)
O. subviridis (Høeg) Erichsen 35(1)
O. tartarea (L.) A. Massal. 7(23)
O. turneri (Sm.) Hasselrot [s.lat.] 48(5)**
Opegrapha dolomitica (Arnold) Clauzade & Cl. Roux 10(14)**
O. niveoatra (Borrer) J.R. Laundon 14(6)
O. parasitica (A. Massal.) H. Olivier [LF]
O. pulvinata Rehm [LF]
O. rupestris Pers. [LF]
O. vermicellifera (Kunze) J.R. Laundon 18(2)
O. vulgata (Ach.) Ach. 32(15)
Ophioparma ventosa (L.) Norman 34(9)

Pachyphiale carneola (Ach.) Arnold 0(5)
Paranectria oropensis (Ces. ex Rabenh.) D. Hawksw. & Piroz. [LF]
Parmelia discordans Nyl. 23(0)
P. ernstiae Feuerer & A. Thell 1(0)*
P. omphalodes (L.) Ach. 49(17)
P. saxatilis (L.) Ach. 160(3)
P. sulcata Taylor 171(0)
Parmeliella triptophylla (Ach.) Müll. Arg. 0(1)
Parmelina pastillifera (Harm.) Hale 10(4)
P. tiliacea (Hoffm.) Hale 22(10)
Parmeliopsis ambigua (Wulfen) Nyl. 87(1)
P. hyperopta (Ach.) Arnold 2(1)
Parmotrema crinitum (Ach.) M. Choisy 1(1)
P. perlatum (Huds.) M. Choisy 37(18)
Pectenia plumbea (Lightf.) P.M. Jørg. et al. 0(3)
Peltigera britannica (Gyeln.) Holt.-Hartw. & Tønsberg 0(2)
P. canina (L.) Willd. 8(0)
P. didactyla (With.) J.R. Laundon 30(7)
P. horizontalis (Huds.) Baumg. 19(12)
P. hymenina (Ach.) Delise ex Duby 52(2)*
P. leucophlebia (Nyl.) Gyeln. 7(2)
P. membranacea (Ach.) Nyl. 35(2)*
P. neckeri Hepp ex Müll. Arg. 6(1)
P. polydactylon (Neck.) Hoffm. 3(2)
P. praetextata (Flörke ex Sommerf.) Zopf 40(9)
P. rufescens (Weiss) Humb. 53(15)
P. venosa (L.) Hoffm. 1(2)
Pertusaria coccodes (Ach.) Nyl. 26(1)
P. flavicans Lamy 1(0)
P. flavida (DC.) J.R. Laundon 10(2)
P. hymenea (Ach.) Schaer. 31(10)
P. lactescens Mudd 7(1)*
P. leioplaca DC. 25(7)
P. pertusa (Weigel) Tuck. 72(12)
P. pseudocorallina (Lilj.) Arnold 30(3)
P. pupillaris (Nyl.) Th. Fr. 8(0)
Petractis clausa (Hoffm.) Kremp. 16(2)
Phaeographis smithii (Leight.) B. de Lesd. 0(2)
Phaeophyscia nigricans (Flörke) Moberg 81(0)
P. orbicularis (Neck.) Moberg 184(0)
P. sciastra (Ach.) Moberg 0(1)
Phaeospora parasitica (Lonnr.) Zopf [LF]
P. rimosicola (Leight. ex Mudd) Hepp [LF]
Phlyctis agelaea (Ach.) Flot. 0(3)
P. argena (Spreng.) Flot. 110(0)
Phylloblastia fortuita Llop & Gómez-Bolea 1(0)
P. inexpectata Sérus. et al. 1(0)
Physcia adscendens (Fr.) H. Olivier 180(1)
P. aipolia (Ehrh. ex Humb.) Fürnr. 36(15)
P. caesia (Hoffm.) Fürnr. 190(0)
P. clementei (Sm.) Maas Geest. 0(1)
P. dubia (Hoffm.) Lettau 84(1)
P. leptalea (Ach.) DC. 1(2)
P. stellaris (L.) Nyl. 3(1)
P. tenella (Scop.) DC. 166(4)
P. tribacia (Ach.) Nyl. 5(3)
Physconia distorta (With.) J.R. Laundon 16(23)
P. enteroxantha (Nyl.) Poelt 18(0)
P. grisea (Lam.) Poelt 124(2)
P. perisidiosa (Erichsen) Moberg 14(0)
Pilophorus strumaticus Nyl. ex Cromb. 1(0)
Placidium lachneum (Ach.) B. de Lesd. 19(6)**
P. pilosellum (Breuss) Breuss 1(1)
P. rufescens (Ach.) A. Massal. 2(1)*
P. squamulosum (Ach.) Breuss 10(0)*
Placopsis lambii Hertel & V. Wirth 4(6)**
Placopyrenium canellum (Nyl.) Gueidan & Cl. Roux 1(1)
P. fuscellum (Turner) Gueidan & Cl. Roux 78(4)
Placynthiella dasaea (Stirt.) Tønsberg 12(0)
P. icmalea (Ach.) Coppins & P. James 121(0)
P. oligotropha (J.R. Laundon) Coppins & P. James 4(1)
P. uliginosa (Schrad.) Coppins & P. James 113(1)
Placynthium garovaglii (A. Massal.) Malme 5(0)
P. nigrum (Huds.) Gray 69(6)
P. subradiatum (Nyl.) Arnold 5(0)
P. tantaleum (Hepp) Hue 4(0)
Platismatia glauca (L.) W.L. Culb. & C.F. Culb. 105(6)

Pleopsidium chlorophanum (Wahlenb.) Zopf 1(0)
Pleurosticta acetabulum (Neck.) Elix & Lumbsch 5(9)
Poeltinula cerebrina (DC.) Hafellner 3(2)
Polyblastia albida Arnold 12(2)
P. cupularis A. Massal. 5(3)
P. dermatodes A. Massal. 6(0)
Polychidium muscicola (Sw.) Gray 1(3)
Polycoccum marmoratum (Kremp.) D. Hawksw. [LF]
P. peltigerae (Fuckel) Vězda [LF]
P. pulvinatum (Eitner) R. Sant. [LF]
P. squamarioides (Mudd) Arnold [LF]
Polysporina lapponica (Schaer.) Degel. 4(0)
P. simplex (Davies) Vězda 65(0)
Porina aenea (Wallr.) Zahlbr. 37(5)
P. borreri (Trevis.) D. Hawksw. & P. James 1(5)
P. byssophila (Körb. ex Hepp) Zahlbr. 4(0)
P. chlorotica (Ach.) Müll. Arg. 41(4)
P. guentheri (Flot.) Zahlbr. var. *guentheri* 1(0)
P. interjungens (Nyl.) Zahlbr. 1(0)
P. lectissima (Fr.) Zahlbr. 6(0)
P. leptalea (Durieu & Mont.) A.L. Sm. 3(0)
P. linearis (Leight.) Zahlbr. 20(1)
P. multipuncta (Coppins & P. James) Ertz et al. 2(0)
P. rivalis Orange 1(0)
Porpidia cinereoatra (Ach.) Hertel & Knoph 41(2)*
P. crustulata (Ach.) Hertel & Knoph 90(6)
P. hydrophila (Fr.) Hertel & A.J. Schwab 4(9)
P. macrocarpa (DC.) Hertel & A.J. Schwab 101(4)
P. melinodes (Körb.) Gowan & Ahti 4(0)
P. platycarpoides (Bagl.) Hertel 7(3)
P. rugosa (Taylor) Coppins & Fryday 5(0)
P. soredizodes (Lamy ex Nyl.) J.R. Laundon 119(0)
P. speirea (Ach.) Kremp. 9(4)
P. tuberculosa (Sm.) Hertel & Knoph 183(0)
Pronectria robergei (Mont. & Desm.) Lowen [LF]
Protoblastenia calva (Dicks.) Zahlbr. 23(3)
P. cyclospora (Hepp ex Körb.) Poelt 1(1)
P. incrustans (DC.) J. Steiner 14(0)
P. lilacina Poelt & Vězda 3(0)
P. rupestris (Scop.) J. Steiner 126(1)
Protopannaria pezizoides (Weber) P.M. Jørg. & S. Ekman 3(7)
Protoparmelia badia (Hoffm.) Hafellner 89(2)
P. memnonia Hafellner & Türk 1(0)
Pseudephebe pubescens (L.) M. Choisy 2(7)
Pseudevernia furfuracea (L.) Zopf 101(8) s.lat., incl. 22(5) s.str.
var. *ceratea* (Ach.) D. Hawksw. 75(6)
Pseudoschismatomma rufescens (Pers.) Ertz & Tehler 3(9)
Pseudothelomma ocellatum (Flot. ex Körb.) M. Prieto & Wedin 1(0)
Psilolechia leprosa Coppins & Purvis 99(0)
P. lucida (Ach.) M. Choisy 181(0)
Psora decipiens (Hedw.) Hoffm. 1(1)
Psoroglaena stigonemoides (Orange) Henssen 3(0)
Psoroma hypnorum (Vahl) Gray 0(3)
Psoronactis dilleniana (Ach.) Ertz & Tehler 2(1)
Psorotichia schaereri (A. Massal.) Arnold 3(1)
Pterygiopsis concordatula (Nyl.) Henssen & P.M. Jørg. 4(0)
P. lacustris P.M. Jørg. & R. Sant. 1(0)
Punctelia borreri (Sm.) Krog 1(0)
P. jeckeri (Roum.) Kalb 18(0)*
P. subrudecta (Nyl.) Krog 64(3) s.lat., incl. 21(0) s.str.
Pycnothelia papillaria Dufour 2(9)
Pyrenula chlorospila Arnold 2(2)
P. macrospora (Degel.) Coppins & P. James 1(2)
P. nitidella (Flörke ex Schaer.) Müll. Arg. 0(1)
Pyrrhospora quernea (Dicks.) Körb. 51(7)

Racodium rupestre Pers. 17(11)
Ramalina calicaris (L.) Fr. 0(7)
R. canariensis J. Steiner 3(2)
R. capitata (Ach.) Nyl. 3(0)
R. cuspidata (Ach.) Nyl. 0(2)
R. farinacea (L.) Ach. 127(5)
R. fastigiata (Pers.) Ach. 33(12)
R. fraxinea (L.) Ach. 17(26)
R. lacera (With.) J.R. Laundon 4(2)
R. siliquosa (Huds.) A.L. Sm. 16(5)
R. subfarinacea (Nyl. ex Cromb.) Nyl. 6(4)
Ramonia chrysophaea (Pers.) Vězda 1(0)
R. interjecta Coppins 2(0)
Rhizocarpon distinctum Th. Fr. 29(0)
R. geographicum (L.) DC. 85(2)
R. lavatum (Fr.) Hazsl. 17(2)
R. lecanorinum Anders 8(0)
R. oederi (Weber) Körb. 36(2)
R. petraeum (Wulfen) A. Massal. 51(9)

R. polycarpum (Hepp) Th. Fr. 1(0)
R. reductum Th. Fr. 159(0)
R. richardii (Nyl.) Zahlbr. 0(7)
R. umbilicatum (Ramond) Flagey 23(7)
R. viridiatrum (Wulfen) Körb. 0(8)
Rhymbocarpus ericetorum (Körb.) Etayo et al. [LF]
Rimularia badioatra (Kremp.) Hertel & Rambold 2(0)
R. intercedens (H. Magn.) Coppins 1(0)
Rinodina atrocinerea (Hook.) Körb. 1(2)
R. bischoffii (Hepp) A. Massal. 9(0)
R. calcarea (Arnold) Arnold 1(0)
R. efflorescens Malme 1(0)
R. immersa (Körb.) Zahlbr. 3(0)
R. oleae Bagl. 168(0)
R. oxydata (A. Massal.) A. Massal. 1(0)
R. pityrea Ropin & H. Mayrhofer 4(0)
R. roboris (Dufour ex Nyl.) Arnold 1(4)
R. sophodes (Ach.) A. Massal. 2(3)
R. teichophila (Nyl.) Arnold 96(1)
Roccellographa circumscripta (Leight.) Ertz & Tehler 0(1)
Romjularia lurida (Ach.) Timdal 19(4)
Ropalospora viridis (Tønsberg) Tønsberg 2(0)
Roselliniopsis gelidaria (Mudd) Matzer [LF]

Sagiolechia protuberans (Ach.) A. Massal. 3(0)
Sarcogyne privigna (Ach.) A. Massal. 6(2)
S. regularis Körb. 127(1)
Sarcopyrenia gibba var. *geisleri* (Beckh.) Nav.-Ros. & Hladun [LF]
Sarcosagium campestre (Fr.) Poetsch & Schied.
var. *campestre* 7(0)
var. *macrosporum* Coppins & P. James 1(0)
Schaereria cinereorufa (Schaer.) Th. Fr. 13(3)
S. fuscocinerea (Nyl.) Clauzade & Cl. Roux var. *fuscocinerea* 7(0)
Sclerococcum griseisporodochium Etayo 2(0)
S. sphaerale (Ach.) Fr. [LF]
Sclerophora pallida (Pers.) Y.J. Yao & Spooner 2(3)
Scoliciosporum chlorococcum (Graewe ex Stenh.) Vězda 90(0)
S. pruinosum (P. James) Vězda 2(0)
S. umbrinum (Ach.) Arnold 158(2)
Scutula circumspecta (Nyl. ex Vain.) Kistenich et al. 2(0)
Scytinium biatorinum (Nyl.) Otálora et al. 7(2)
S. callopismum (A. Massal.) Otálora et al. 1(0)
S. fragile (Taylor) Otálora et al. 2(0)
S. fragrans (Sm.) Otálora et al. 0(4)
S. gelatinosum (With.) Otálora et al. 40(3)**
S. intermedium (Arnold) Otálora et al. 1(0)
S. lichenoides (L.) Otálora et al. 32(10)**
S. massiliense (Nyl.) Otálora et al. 2(0)
S. palmatum (Huds.) Gray 0(3)
S. parvum (Degel.) Otálora et al. 2(0)
S. plicatile (Ach.) Otálora et al. 9(1)
S. pulvinatum (Hoffm.) P.M. Jørg. & Wedin 10(5)*
S. schraderi (Ach.) Otálora et al. 16(6)
S. tenuissimum (Hoffm.) Otálora et al. 1(7)
S. teretiusculum (Wallr.) Otálora et al. 3(1)
S. turgidum (Ach.) Otálora et al. 21(6)
Skyttea buelliae Sherwood et al. [LF]
S. gregaria Sherwood et al. [LF]
S. tephromelarum Kalb & Hafellner [LF]
Solenopsora candicans (Dicks.) J. Steiner 39(4)
S. vulturiensis A. Massal. 1(0)
Solorina saccata (L.) Ach. 25(14)
S. spongiosa (Ach.) Anzi 6(7)
Sphaerophorus fragilis (L.) Pers. 13(11)
S. globosus (Huds.) Vain. 23(22)
Sphinctrina turbinata (Pers.) De Not. [LF]
Sporodictyon cruentum (Körb.) Körb. 1(0)
S. schaererianum A. Massal. 1(0)
S. terrestre (Th. Fr.) Savić & Tibell 1(0)
Sporodophoron cretaceum (Hue) Ertz & Frisch 1(0)
Squamarina cartilaginea (With.) P. James 20(6)
Staurothele bacilligera (Arnold) Arnold 1(0)
S. caesia (Arnold) Arnold 5(0)
S. fissa (Taylor) Zwackh 5(2)
S. guestphalica (Lahm ex Körb.) Arnold 4(0)
S. hymenogonia (Nyl.) Th. Fr. 5(5)
S. rugulosa (A. Massal.) Arnold 1(0)
S. rupifraga (A. Massal.) Arnold 11(3)
S. succedens (Rehm ex Arnold) Arnold 3(0)
Steinia geophana (Nyl.) Stein 4(0)
Stenocybe pullatula (Ach.) Stein [F]
S. septata (Leight.) A. Massal. [F]
Stereocaulon condensatum Hoffm. 0(6)
S. dactylophyllum Flörke 13(7)
S. evolutum Graewe 13(6)
S. nanodes Tuck. 4(0)
S. pileatum Ach. 31(0)

***S. vesuvianum* Pers. 48(5)**
var. *nodulosum* (Wallr.) I.M. Lamb 4(3)
var. *symphycheileoides* I.M. Lamb 2(0)
Sticta fuliginosa (Hoffm.) Ach. 0(5)
S. limbata (Sm.) Ach. 0(6)
S. sylvatica (Huds.) Ach. 0(7)
***Stigmidium congestum* (Körb.) Triebel [LF]**
***S. microspilum* (Körb.) D. Hawksw. [LF]**
***S. placynthii* Cl. Roux & Nav.-Ros. [LF]**
***Strangospora moriformis* (Ach.) Stein 7(1)**
***S. pinicola* (A. Massal.) Körb. 15(0)**
***Strigula jamesii* (Swinscow) R.C. Harris 3(0)**
***S. taylorii* (Carroll ex Nyl.) R.C. Harris 1(0)**
***Synalissa symphorea* (Ach.) Nyl. 2(4)**

***Telogalla oliveri* (Vouaux) Nik. Hoffm. & Hafellner [LF]**
***Tephromela atra* (Huds.) Hafellner ex Kalb 136(8)**
var. *torulosa* (Flot.) Hafellner 0(1)
***T. grumosa* (Pers.) Hafellner & Cl. Roux 23(0)**
***Thalloidima sedifolium* (Scop.) Kistenich et al. 20(7)**
***Thelenella muscorum* (Fr.) Vain. 2(0)**
***Thelidium decipiens* (Nyl.) Kremp. 42(2)**
***T. fontigenum* A. Massal. 4(0)**
***T. impressum* (Stizenb.) Zschacke 3(0)**
***T. incavatum* Mudd 41(5)**
***T. minutulum* Körb. 27(2)**
***T. papulare* (Fr.) Arnold 10(1)**
***T. pluvium* Orange 1(0)**
***T. pyrenophorum* (Ach.) Mudd 2(4)**
***T. zwackhii* (Hepp) A. Massal. 11(1)**
***Thelocarpon intermediellum* Nyl. 1(0)**
***T. laureri* (Flot.) Nyl. 6(0)**
***T. lichenicola* (Fuckel) Poelt & Hafellner [LF]**
***Thelotrema lepadinum* (Ach.) Ach. 38(14)**
Thrombium epigaeum (Pers.) Wallr. 0(1)
***Tomasellia gelatinosa* (Chevall.) Zahlbr. [F]**
***Toniniopsis aromatica* (Sm.) Kistenich et al. 105(7)**
***T. verrucarioides* (Nyl.) Kistenich et al. 5(3)**
***Trapelia coarctata* (Sm.) M. Choisy 160(5)**
***T. corticola* Coppins & P. James 3(0)**
***T. glebulosa* (Sm.) J.R. Laundon 128(2)**
***T. obtegens* (Th. Fr.) Hertel 64(0)**
***T. placodioides* Coppins & P. James 156(0)**
***Trapeliopsis flexuosa* (Fr.) Coppins & P. James 68(1)**

***T. gelatinosa* (Flörke) Coppins & P. James 6(1)**
***T. glaucolepidea* (Nyl.) Gotth. Schneid. 3(0)**
***T. granulosa* (Hoffm.) Lumbsch 152(2)**
***T. percrenata* (Nyl.) Gotth. Schneid. 3(0)**
***T. pseudogranulosa* Coppins & P. James 33(0)**
T. viridescens (Schrad.) Coppins & P. James 0(2)
***Tremella lichenicola* Diederich [LF]**
T. protoparmeliae Diederich & Coppins [LF]
***Tremolecia atrata* (Ach.) Hertel 15(2)**
***Trichonectria hirta* (A. Bloxam) Petch [LF]**
***Tuckermanopsis chlorophylla* (Willd.) Hale 74(2)**
***Tylothallia biformigera* (Leight.) P. James & H. Kilias 1(0)**

***Umbilicaria cylindrica* (L.) Delise ex Duby 3(1)**
***U. deusta* (L.) Baumg. 9(1)**
***U. polyphylla* (L.) Baumg. 32(16)**
***U. polyrrhiza* (L.) Fr. 6(12)**
***U. proboscidea* (L.) Schrad. 1(5)**
***U. torrefacta* (Lightf.) Schrad. 10(7)**
***Unguiculariopsis lesdainii* (Vouaux) Etayo & Diederich [LF]**
***U. thallophila* (P. Karst.) W.Y. Zhuang [LF]**
Usnea articulata (L.) Hoffm. 0(3)
U. ceratina Ach. 0(1)
***U. cornuta* Körb. 3(0)**
***U. dasopoga* (Ach.) Nyl. 4(2)**
U. flammea Stirt. 0(1)
U. florida (L.) F.H. Wigg. 0(10)
U. hirta (L.) F.H. Wigg. 0(2)
***U. subfloridana* Stirt. 84(5)**

***Varicellaria hemisphaerica* (Flörke) I. Schmitt & Lumbsch 23(0)**
***V. lactea* (L.) Arnold I. Schmitt & Lumbsch 18(6)**
***Verrucaria aethiobola* Wahlenb. 19(7)**
***V. anziana* Garov. 1(0)**
***V. aquatilis* Mudd 17(5)**
***V. baldensis* A. Massal. 105(1)**
***V. bryoctona* (Th. Fr.) Orange 4(0)**
***V. caerulea* DC. 12(7)**
***V. calciseda* DC. 7(3)**
V. cyanea Massal. 0(3)
***V. ditmarsica* Erichsen 3(0)**
***V. dolosa* Hepp 14(6)**
***V. dufourii* DC. 15(6)**
***V. elaeina* Borrer 5(0)**
***V. elaeomelaena* (A. Massal.) Arnold 9(1)**
***V. funckii* (Spreng.) Zahlbr. 3(0)**

V. halizoa Leight. 2(1)
V. hochstetteri Fr. 107(1)
V. hydrophila Orange 17(5)
V. knowlesiae P.M. McCarthy 1(0)
V. macrostoma Dufour ex DC. f. *macrostoma* 47(4)
f. *furfuracea* de Lesd. 63(0)
V. madida Orange 1(0)
V. margacea (Wahlenb.) Wahlenb. 3(7)
V. mucosa Wahlenb. 8(1)
V. muralis Ach. 177(2)
V. murina Leight. 13(3)
V. nigrescens Pers. 181(0)
V. obfuscans Nyl. 1(0)
V. ochrostoma (Borrer ex Leight.) Trevis. 7(1)
V. parmigerella Zahlbr. 1(0)
V. phaeosperma Arnold [LF]
V. pinguicula A. Massal. 3(2)
V. polysticta Borrer 2(0)
V. praetermissa (Trevis.) Anzi 15(1)
V. sandstedei B. de Lesd. 1(0)
V. simplex P.M. McCarthy 1(0)
V. striatula Wahlenb. 3(2)
V. viridula (Schrad.) Ach. 156(3)
Vezdaea acicularis Coppins 2(0)
V. aestivalis (Ohlert) Tscherm.-Woess & Poelt 7(0)
V. leprosa (P. James) Vězda 7(0)
V. retigera Poelt & Döbbeler 4(0)
V. rheocarpa Poelt & Döbbeler 2(0)
Violella fucata (Stirt.) T. Sprib. 44(0)
Vouauxiella lichenicola (Linds.) Petr. & Syd. [LF]
Vouauxiomyces ramalinae (Nordin) D. Hawksw. [LF]
Vulpicida pinastri (Scop.) Mattson & M.J. Lai 0(4)

Watsoniomyces obsoletus (Nyl.) D. Hawksw. et al. 1(0)
Weddellomyces epicallopisma (Wedd.) D. Hawksw. [LF]

Xanthoparmelia conspersa (Ehrh. ex Ach.) Hale 16(17)
X. loxodes (Nyl.) O. Blanco et al. 1(0)
X. mougeotii (Schaer. ex D. Dietr.) Hale 12(11)
X. verruculifera (Nyl.) O. Blanco et al. 6(0)
Xanthoria aureola (Ach.) Erichsen 2(0)
X. calcicola Oxner 143(1)
X. candelaria (L.) Th. Fr. [s.lat.] 156(1)**
X. elegans (Link) Th. Fr. 34(4)
X. parietina (L.) Th. Fr. 188(1)
X. polycarpa (Hoffm.) Th. Fr. ex Rieber 123(3)
X. ucrainica S.Y. Kondr. 16(0)*
Xanthoriicola physciae (Kalchbr.) D. Hawksw. [LF]
Xylographa parallela (Ach.) Belhen & Desberger 1(0)
Xylopsora caradocensis (Leight. ex Nyl.) Bendiksby & Timdal 14(6)
X. friesii (Ach.) Bendiksby & Timdal 0(2)

Zwackhiomyces coepulonus (Norman) Grube & R. Sant. [LF]
Z. dispersus (J. Lahm ex Körb.) Triebel & Grube [LF]

Excluded Taxa

Listed here are 47 taxa awaiting verification or are doubtfully recorded for Yorkshire; 16 of these (prefixed by *) have been tentatively removed from the 2008 Checklist, and 31 are additional to those 'excluded taxa' listed in Seaward (1994, 2008) – sadly many of these are unsupported by herbarium material to substantiate the older records.

**Ainoa mooreana* (Carroll) Lumbsch & I. Schmitt, *Aspicilia gibbosa* (Ach.) Körb., *Athallia vitellinula* (Nyl.) Arup et al., *Biatora meiocarpa* (Nyl.) Arnold, **Bryoria capillaris* (Ach.) Brodo & D. Hawksw., **Buellia subdisciformis* (Leight.) Vainio, *Caloplaca lithophila* H. Magn., **Cetraria ericetorum* Opiz, *Cladonia amaurocraea* (Flörke) Schaer., **C. convoluta* (Lam.) Anders, **Dacampia hookeri* (Borrer) A. Massal., **Ephebe lanata* (L.) Vain., *Gabura fascicularis* (L.) P.M. Jørg., *Gyrographa saxigena* (Taylor) Ertz & Tehler, *Hydropunctaria amphibia* (Clemente) Cl. Roux, **Hypotrachyna sinuosa* (Sm.) Hale, *Lecanora formosa* (Bagl. & Carestia) Knoph & Leuckert, *Lepraria borealis* Loht. & Tonsberg, *L. crassissima* (Hue) Lettau, **Leptogium saturninum* (Dicks.) Nyl., *Massalongia carnosa* (Dicks.) Körb., *Melanelia hepatizon* (Ach.) A.

Thell, *M. stygia* (L.) Essl., *Micarea subnigrata* (Nyl.) Coppins & H. Kilias, *Mycoglaena myricae* (Nyl.) R.C. Harris, *Mycoporum crataeginum* (Minks) Arnold, *Ochrolechia pallescens* (L.) A. Massal., **Orphniospora moriopsis* (A. Massal.) D. Hawksw., *Pannaria conoplaea* (Ach.) Bory, **P. rubiginosa* (Ach.) Bory, *Peltigera aphthosa* (L.) Willd., *Placopsis gelida* (L.) Linds., *Placynthium tremniacium* (A. Massal.) Jatta, *Porpidia flavocruenta* Fryday & Buschbom, **Protoparmelia atriseda* (Fr.) R. Sant. & V. Wirth, *Rhizocarpon geographicum* subsp. *prospectans* (Räsänen) D. Hawksw. & Sowter, **Sclerophora peronella* (Ach.) Tibell, *Scoliciosporum intrusum* (Th. Fr.) Hafellner, *Scytinium subtile* (Schrad.) Otalora et al., **Teloschistes flavicans* (Sw.) Norman, *Thelidium cataractarum* (Hepp) Lönnr., **Umbilicaria hyperborea* (Ach.) Hoffm., *Usnea barbata* (L.) F.H. Wigg., *U. sublurida* Stirt., *Verrucaria cernaensis* Zschacke, *Xanthoria fulva* (Hoffm.) Poelt & Petut. and **Zwackhia viridis* (Ach.) Poetsch & Schied.

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St. Nicholas Fields, York, in 2020

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Introduction to the reserve and the Wildwatch group

St Nicholas Fields is a small urban nature reserve in York. Species recording continued at the reserve during the COVID-19 pandemic in 2020 by the Wildwatch survey group. Many significant species' records were made during this time and are summarised in this paper, including eight species new to North-east Yorkshire (VC62) and one species apparently new to Yorkshire.

When I first explored St Nicholas Fields (colloquially referred to as 'St Nicks') in March 2020, about five months after moving to York and just before the UK was plunged into a nationwide lockdown to combat the COVID-19 pandemic, I must admit that I was disappointed. The reserve felt small and hemmed in by urban development. I longed to keep on walking further, *beyond*, but always arrived quickly at a reserve boundary. The woodland areas appeared uninteresting, with mostly fairly young trees, little diversity of canopy structure and not much in the way of ground flora. It was popular with (dog-)walkers and I assumed that the reserve suffered all the more for it. Was it, as George Monbiot would put it, little more than a 'glorified dog toilet'?

Dog fouling is certainly an issue on the reserve, but there are several reasons why my opinion of St Nicholas Fields transformed in the following months. It was unfair of me to base an assessment on March, when so much of the reserve was still bare and wintry. As the unusually warm, sunny spring and summer developed, the reserve burst into life. I could appreciate the wildflower-rich swards at the margins of so many of the woodland compartments. Indeed, I could appreciate the diversity of habitats that the reserve packs in: grassy meadow; coarse tussocky grassland; wildflower-rich margins; stands of tall herbs; hedgerow; scrub; young woodland; some older, larger trees; Osbaldwick and Tang Hall Beck; some patches that almost have a heathy feel, with Gorse *Ulex europaeus* and Broom *Cytisus scoparius*; and the human embellishments of boulders, bricks, rubble, tarmac, concrete and gravel.

When Jane Thomas encouraged me to join the Wildwatch group, which surveys the reserve for two hours every Wednesday morning, my appreciation of the reserve deepened further. Even in this relatively small site I kept on finding new corners that I hadn't known existed. Far from being too small, the reserve felt like the perfect size. It was possible to become familiar with every nook and cranny and yet forever be surprised; there are also places where you can stand and almost entirely forget that the reserve is an island surrounded by an urban sea. Even the winter became endlessly fascinating as I learnt from Jane about the slugs, snails, woodlice, millipedes and springtails that she found under logs and rocks, and I made it my mission to boost the reserve's bryophyte list from 20 up to its current, respectable, 48 species. The Wildwatch group is what every nature reserve needs: a dedicated bunch of enthusiastic naturalists with varied taxonomic interests that undertakes regular and long-term species surveying. The benefits of recording at a small site and having a pan-species listing mentality (Lyons, 2014) is that you are constantly encouraged to look closer that you did before – new worlds always open up to the curious naturalist – and begin to understand how everything fits together, the whole ecological picture. Crucially, there is an excellent rapport between Wildwatch and the reserve managers,

who actively incorporate Wildwatch's recommendations into their practical work schedule.

The Wednesday Wildwatch sessions were able to continue (often in a socially distanced fashion) throughout the COVID-19 pandemic in 2020 – I think we all appreciated the chance to engage with the natural world during what was in many ways a very difficult time – and it is during these sessions that a substantial number of unusual species were recorded, further vindicating St Nicholas Fields as a valuable biodiversity hotspot in the heart of York.

Notable species recorded in 2020

I focus here on the rarest or most unusual species recorded by the author and the Wildwatch group in 2020 (with one species from the end of 2019). There are many more species than those listed here that are of particular conservation or ecological interest, including many that are scarce nationally; a future paper (Buckton, in prep.) will describe the plant parasites of the reserve, which include many of the other unusual species omitted here.

Figure 1. Balkan Threeband Slug *Ambigolimax nyctelius*. Left: adult, showing the characteristically strong dark bands. Right: a developing embryo at week 5. *Photos: Jane Thomas*

PLANTS

Lesser Screw-moss *Syntrichia virescens* (Bryophyta: Pottiales). On 31 October 2020 I noticed a small moss growing with Capillary Thread-moss *Bryum capillare* in fissures along the edge of the main tarmac path that runs centrally through the reserve (SE61685178). Perhaps surprisingly, this turned out to be the first VC62 record of Lesser Screw-moss. I subsequently found it nearby on Elder *Sambucus nigra* (SE61715184), growing with its cousin Great Hairy Screw-moss *Syntrichia ruralis*, which has recently been elevated to full species status (Hodgetts et al., 2020).

OOMYCETES

Peronospora meliloti (Oomycota: Peronosporales). I found this downy mildew on melilot *Melilotus* sp. near the Dragon Stones (a 'stone circle' of monoliths) on 26 July 2020. This was the first record for VC62 and the fifth for Yorkshire.

INVERTEBRATES

Aceria tuberculata (Acari: Eriophyidae). Tansy *Tanacetum vulgare* is one of St Nicks' most showy plants in high summer and Wildwatch has found numerous invertebrate species associated

uniquely with this host. This gall mite causes thin leaf rolls on Tansy; my record on 29 July 2020 along the 'Butterfly Walk' at SE617518 appears to be the first for VC62.

Balkan Threeband Slug *Ambigolimax nyctelius* (Gastropoda: Limacidae). A slug collected by Jane Thomas on 21 October 2020 in the meadow area around SE617517 was confirmed via dissection by Ben Rowson. An earlier photographic record of Jane's from 23 September 2020 on the Butterfly Walk (SE617518) is also very likely to be this species. Jane has subsequently made a remarkable documentation of *A. nyctelius* development from eggs (Figure 1, p97).

This slug is apparently only previously known from greenhouses in VC64; Jane's records are the first for VC62 (and bring the reserve's slug checklist up to an impressive 15 species). It in fact appears rather widespread on the reserve, at least in its eastern portion – it has also been found in the Substation Woods (SE618518), for instance. Jane is currently examining old photographic records of what was first identified as the similar Iberian Threeband Slug *A. valentianus*, which is also known on the reserve, in case older records of Balkan Threeband Slug have been lurking undetected - it seems unlikely that the latter can have become so widespread so quickly.

Tawny Soil Slug *Arion owenii* (Gastropoda: Arionidae). First found 11 December 2019 by Jane Thomas near the Environment Centre, mostly under bricks (SE616516), and subsequently relocated there in some numbers. Surprisingly, after finding large numbers under a single brick, they had all disappeared the following week. The Tawny Soil Slug is a handsome little slug, appearing like a rather appetising humbug sweet when defensively bunched up. Jane's record is the first for the York area and only the second for VC62.

Netted Field Slug *Deroceras reticulatum* (Gastropoda: Agriolimacidae). (see Figure 2 p100). This is a common slug in Britain but an unusual black form was found near the Gorse *Ulex europaeus* bushes (SE616517) at St Nicks by Jane Thomas on 5 February 2020. It has been found subsequently near the Environment Centre, along Lungwort Lane and at 'Ladybird Corner' (SE614519), so is very widespread across the reserve. The black form appears to be rare in Britain but common at St Nicks, which is sometimes the sign of a new, introduced population (Chris du Feu, pers. comm.). Netted Field Slug has been found on the reserve in almost every possible shade from black to almost white!

Blepharidopterus diaphanus (Heteroptera: Miridae). I swept this green mirid bug from its host plant White Willow *Salix alba* on 10 August 2020 (the bug is also found on Weeping Willow *Salix* x *sepulchralis*). Although there is a decent smattering of records across Yorkshire, the St Nicks record is the first for VC62. This distribution of this bug has seen some huge jumps in recent years. Before 2019, the northernmost record of *B. diaphanus* in Britain was Durham (Jim Flanagan, pers. comm.); in 2019 I found it new to Scotland at Loch Lomond (Buckton, 2020) and Brian Nelson then promptly found it new to Ireland. Has it been spreading recently or has it always been widespread and simply unnoticed…?

Roesel's Bush-cricket *Metrioptera roeselii* (Orthoptera: Tettigoniidae). (see Figure 2, p100). I heard and recorded the characteristic song of this bush cricket, sometimes likened to the buzz of overhead power lines, in the meadow area on 14 August 2020. It was confirmed by Phillip Whelpdale on the basis of the song as new to VC62, and an individual was subsequently photographed by Amy Bowman. Roesel's Bush-cricket has had a huge range expansion in

Yorkshire in recent years (Whelpdale, 2019), perhaps aided by climate change, although it had previously bypassed VC62 by apparently skirting around and up the A1 to Ripon, possibly transported in agricultural products (Phillip Whelpdale, pers. comm.).

Ocys tachysoides (Coleoptera: Carabidae). (see Figure 2, p100). This ground beetle was collected by Jane Thomas at Lungwort Lane (SE615516) on 2 December 2020 and was confirmed as a female *O. tachysoides* via dissection by Bob Marsh. *Ocys tachysoides* is rarely identified to species level and is usually recorded as the aggregate with *O. harpaloides*; since the recognition of *O. tachysoides* by Maddison & Anderson (2016), all of Yorkshire's 220-odd records of '*Ocys harpaloides*' are now in doubt (Bob Marsh, pers. comm.). The two species are difficult to separate without dissection. A beetle recorded as *O. harpaloides* but likely to be *O. tachysoides* in light of the recent record, has been known at St Nicks for some years. It is surprising that the distinction between *O. harpaloides* and *tachysoides* has gone unnoticed for so long, given the intensive study of *Bembidion*-like beetles (Bob Marsh, pers. comm.). As well as morphological differences, *O. harpaloides* tends to be associated with relatively open, exposed, often wet habitats whilst *O. tachysoides* is mainly a woodland insect, usually found under the bark of decaying timber (although habitat differences are not so clear in Continental Europe) (Bob Marsh, pers. comm.; Maddison & Anderson, 2016). Interestingly, the elytral sculpturing of these beetles may be an adaptation to their respective habitats: the finer meshes on *O. harpaloides* elytra may be more effective at shedding water than the broader meshes on *O. tachysoides* elytra (Bob Marsh, pers. comm.). The St Nicks *O. tachysoides* record is the fourth confirmed in Yorkshire and the second for VC62.

Coppery Long-horn *Nemophora cupriacella* (Lepidoptera: Adelidae). (see Figure 2, p100). This pretty little long-horn micro-moth, which is Nationally Scarce B, was first found 1 July 2020 by Jane Thomas on Teasel *Dipsacus fullonum* along 'Lungwort Lane' (SE615516). Up to three individuals were seen each week until 15 July 2020, spread between these Teasels and those near the Dragon Stones in SE616518. There are no previous modern records of this micromoth in VC62 and only a handful in Yorkshire, where it is classified as a 'very rare and very local resident' (Yorkshire Moths website: http://www.yorkshiremoths.info/portal). It is thought that all individuals of this species in Britain are self-fertile females; they were certainly observed busily ovipositing into the Teasel flowerheads. The moth is often associated with scabiouses but, even though there is Field Scabious *Knautia arvensis* at the Dragon Stones, they were never observed there.

Willow Bent-wing *Phyllocnistis saligna* (Lepidoptera: Gracillariidae). One of the 80-odd leaf-miners recorded by the author new to the reserve in 2020 was this micro-moth, a local species nationally and the first record for VC62. I found its winding corridor mine on White Willow by the Environment Centre (SE61635164) on 4 October 2020 (See Figure 3 p101).

Jaapiella volvens (Diptera: Cecidomyiidae). This is another insect that must surely be seriously under-recorded; my record of this gall midge from St Nicks is the first for VC62. It causes subtle little rolls on leaflets of Meadow Vetchling *Lathyrus pratensis*. I found it near the meadow area on 2 August 2020 at SE61775177.

Ozirhincus hungaricus Möhn, 1968 (Diptera: Cecidomyiidae). On 17 August 2020 I examined Tansy flowerheads outside the Environment Centre for galled achenes. Sure enough, galled

achenes containing orange cecidomyiid larvae cosily curled up inside them were frequent. Microscopic examination revealed these larvae to be *O. hungaricus*, which would appear to be new to Yorkshire and may be only the second record for Britain, having been recorded new to Britain by Jenny Seawright in Devon in 2018. *O. hungaricus* is similar to *O. longicollis* and the genus has recently undergone a major revision (Dorchin et al., 2015); it is likely to be severely under-recorded.

Figure 2. Clockwise from top left: a black form of Netted Field Slug *Deroceras reticulatum* (Jane Thomas); *Ocys tachysoides* (Jane Thomas); Roesel's Bush-cricket *Metrioptera roeselli* (Amy Bowman); Coppery Long-horn *Nemophora cupriacella* on Teasel *Dipsacus fullonum* (Jane Thomas).

Figure 3. Left: a Tansy *Tanacetum vulgare* flowerhead with an achene galled by *Ozirhincus hungaricus*. Right: a White Willow leaf mined by Willow Bent-wing *Phyllocnistis saligna*.
(Photos: Sam Buckton)

Acknowledgements

I wish to thank the following experts for their comments or verification on the species discussed in this paper: Tom Blockeel (Lesser Screw-moss), Chris Yeates (*Peronospora meliloti*), Tom Higginbottom (plant galls), Ben Rowson (slugs), Adrian Norris (Balkan Threeband Slug), Stuart Foster (*Blepharidopterus diaphanus*), Chris du Feu (Netted Field Slug), Phillip Whelpdale (Roesel's Bush-cricket), Robert Woods (Coppery Long-horn), Bob Marsh (*Ocys tachysoides*), Andrew Grayson (guidance on Yorkshire Diptera) and Charles Fletcher (Willow Bent-wing). I am also grateful to Jane Thomas for supplying details of all her notable records.

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Additions and corrections to the Yorkshire Diptera list (part 10)

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Additions and re-instatements to the Yorkshire Diptera list

SYRPHIDAE

Brachyopa pilosa Collin, 1939: VC61: Allerthorpe Common (SE755480) 18.iv.2019 (1♂ swept from branches of birch at a pine plantation edge and near mature Aspen *Populus tremula*) IJA.

ULIDIIDAE

Melieria cana (Loew, 1858): VC61: North Ferriby (SE972248) 24.07.2020 (2♂) IJA.

MUSCIDAE

Phaonia consobrina (Zetterstedt, [1838]): VC64: formerly provisionally excluded from the Yorkshire list by Grayson (2006) with the comment "Recorded in 'The Naturalist 1920-1929' according to a circulated list; however, there appears to be no such record". Now re-instated to the list, having been recorded by RAZ from three sites around Ribblehead and one near Malham Tarn, his records being: Ashes Pasture and Meadow (SD776784) 20.v.2020 (1♂, 2♀) RAZ; Colt Park Meadow (SD772776) 20.v.2020 (1♂) RAZ; Globeflower Wood (SD872666) 21.v.2020 (2♂, 9♀) & 29.v.2020 (1♂, 3♀) RAZ; and Scar Close (SD749775) 20.v.2020 (1♀) RAZ.

SARCOPHAGIDAE

Sarcophaga (*Heteronychia*) *vicina* Macquart, 1835: VC64: Globeflower Wood (SD872666) 14.vi.2020 (1♂) RAZ.

Exclusions from the Yorkshire Diptera list

ANTHOMYIIDAE

It is necessary to exclude from the Yorkshire list the following two Anthomyiidae species which are recorded on the NBN Atlas https://nbnatlas.org, viz. *Pegomya depressiventris* (Zetterstedt, 1845) and *Phorbia nuditibia* d'Assis-Fonseca, 1966. Both were recorded from the Rotherham area (as single males), and both are excluded on advice from DMA, who reported (pers. comm.), that he had obtained the male *Phorbia* specimen from the recorder, and had re-identified it as *P. sepia* (Meigen, 1826). Unfortunately, the *Pegomya* specimen became damaged during identification, and was not retained by the recorder; therefore, DMA was unable to verify or discount the record, but considered that the identification would probably be erroneous. DMA also reported, that both these species are known only from single British sites, viz. *Phorbia nuditibia* from Leigh Woods (near Bristol), and *Pegomya depressiventris* from Aberdeenshire.

Acknowledgements

In respect of the following additions and corrections to the Yorkshire Diptera list, the writer is indebted to Ian Andrews (IJA), Rob Zloch (RAZ), and the late Mike Ackland (DMA).

Reference

Grayson, A. (2006) Additions and Corrections to the Yorkshire Diptera List (Part 3). *The Naturalist* 131: 131-138.

The breeding birds of Potteric Carr and Carr Lodge Nature Reserves (2015-19)

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Introduction

Potteric Carr and Carr Lodge Nature Reserves are a pair of adjacent sites (divided by a trunk road but essentially a continuous block of land) on the edge of Doncaster (Figure 1, p104) managed by the Yorkshire Wildlife Trust (YWT). The sites have a wide variety of biological interest, perhaps best known for their bird assemblage. Although surveys and monitoring are undertaken to see how many species are seen on site each year, and how many breeding species there are, there has been no methodical attempt to look at the magnitude of the breeding bird community until now.

Here we present an initial review and look at the ways in which the data can be analysed to be useful for management planning and for understanding the site.

Methods

Since 2015 an annual breeding bird survey (largely based on the old BTO Common Bird Census (CBC) method) has been undertaken on the sites. However, due to the large size of the sites and the lack of skilled surveyors to cover their entirety in a single year, the sites were subdivided into 10 blocks; 2 blocks were surveyed each year (a single block being a manageable size to survey in a single morning). It has therefore taken 5 years (until the end of the 2019 breeding season) to survey the whole area. There are areas of Potteric Carr Nature Reserve that have not been covered by the surveys due to access restrictions, but otherwise an attempt to cover the whole site has been made.

The Yorkshire Wildlife Trust survey method is similar to the old CBC in that it involves mapping all birds seen and/or heard in the given area (covered by the same transect route each time); each area was surveyed 6 times, at intervals of at least 10 days, during the breeding season. Each bird was marked on a map, including some basic information (e.g. sex if known, if it was singing, if it flew in a particular direction, nest building etc.). A single map of each visit was produced, showing information about all species. For ease of interpretation, the territories were then transposed onto single species maps, eventually containing all the information from each of the 6 visits. Areas with repeated records of birds thought to be holding a territory are then delineated and the numbers of territories can be worked out. There is a degree of background information needed to gauge where one territory ends and the next begins; this is achieved through knowledge of the birds involved and using an experienced surveyor/analyser of the data. Black-headed Gull *Chroicocephalus fidibundus,* being a colonial breeder, was surveyed by a single count of nests undertaken once the birds had settled into an area.

Due to the time-consuming data gathering and analysis, the CBC method was largely discontinued by the BTO in 2000 (some site specific CBC surveys are still undertaken). Minor changes to the method (e.g. limiting the number of visits to 6 rather than 10) were made to

Figure 1. Potteric Carr and Carr Lodge nature reserves shown with red line.

make a new YWT method that is consistently applied across a significant minority of our nature reserves. Although extensive nest-searching may find more nests, for 70% of birds the CBC is a good measure of bird populations if done by an experienced surveyor (Baillie et al, 2012).

The data can then be used to produce a list of birds that are assumed to be breeding (the method only allows mapping of territories but breeding is presumed) and, therefore, the numbers of pairs/nests (not all birds nest as pairs). These can then be further analysed by putting the territories onto a GIS program and working out hotspots where there are larger numbers of territories in the same area.

Results

There are a number of ways we can look at the results of the surveys. The simplest is perhaps to look at the headline figure of an estimate of the total number of breeding pairs/nests across Potteric Carr and Carr Lodge: 1633. As a very crude measure, when the sites have been resurveyed (which will be complete after another 5 years of survey) we can see if this number has increased, decreased or stayed the same. This is a big number, but perhaps of little use without knowing which species (it could be 1633 pairs of a single bird). Table 1 below shows the most and least numerous birds from this survey.

The most frequent include common garden, scrub and woodland birds. Wren *Troglodytes troglodytes*, Blackcap *Sylvia atracapilla*, Robin *Erythracus rubecula* and Blue Tit *Cyanistes caeruleus* are all known to be fairly numerous and there is plenty of woodland and scrub

habitat on the sites. The fifth species on the list, Reed Warbler *Acrocephalus scirpaceus*, only makes sense knowing that Potteric Carr has extensive areas of reedbed. Many of the commonest birds were recently listed as numerous nationally (BTO, 2020) with Wren being the most common, whereas others high up the national list (such as House Sparrow *Passer domesticus* and Woodpigeon *Columba palumbus*) were edged out at Potteric Carr and Carr Lodge by birds specific to the sites' habitats, such as Reed Warbler and Coot *Fulica atra*. The top 9 birds account for more than half of the 1633 territories whereas there are 12 birds with only a single territory.

Table 1. Number of territories for each bird (67 in total).

Species	Territories	Species	Territories	Species	Territories
Wren	195	Greylag Goose	24	Redshank	4
Blackcap	123	Little Grebe	24	Skylark	4
Robin	113	Magpie	23	Buzzard	3
Blue Tit	81	Pochard	23	Mistle Thrush	3
Reed Warbler	80	Moorhen	19	Bittern	2
Chiffchaff	75	Cetti's Warbler	16	Coal Tit	2
Great Tit	63	Carrion Crow	13	Shelduck	2
Dunnock	60	Lapwing	12	Starling	2
Black-headed Gull	58	Pheasant	12	Stock Dove	2
Blackbird	55	Song Thrush	12	Willow Tit	2
Coot	52	Bullfinch	11	Yellow Wagtail	2
Reed Bunting	46	Teal	11	Avocet	1
Wood Pigeon	46	Great Crested Grebe	10	Barn Owl	1
Mallard	45	Mute Swan	10	Bearded Tit	1
Gadwall	30	Shoveler	10	Black Necked Grebe	1
Tufted Duck	30	Snipe	10	Great Spotted Woodpecker	1
Whitethroat	29	Treecreeper	10	Greenfinch	1
Canada Goose	27	Sedge Warbler	9	Kestrel	1
Willow Warbler	27	Garden Warbler	8	Lesser Whitethroat	1
Goldfinch	26	Jackdaw	5	Linnet	1
Chaffinch	25	Jay	5	Marsh Harrier	1
Long Tailed Tit	25	Water Rail	5	Nuthatch	1
				Oystercatcher	1

Cetti's Warbler *Cettia cetti* having 16 territories is perhaps significant, given that it was not recorded as breeding in the UK until 1972. It has now spread across large parts of the country. A juvenile bird ringed at Potteric Carr in 2018 was retrapped in 2019 at Leighton Moss and, given the large number of territories, it suggests that Potteric Carr is a productive habitat for this bird, perhaps even a source population for colonisation more generally.

At the other end, those with few breeding territories include Barn Owl *Tyto alba*, Bittern

Botaurus stellaris and Willow Tit *Poecile montanus*. Barn Owl has large territories and there are few natural nest sites; Bittern has increased in recent years but is not found in high densities, so neither would be expected in large numbers; whereas Willow Tit has declined nationally by 94% between 1970 and 2012 (Back from the Brink, 2019) and a similar decline has also been seen at Potteric Carr. Other birds that have decreased include Starling *Sturnus vulgaris* (2 pairs in this survey; 8 pairs in the 1980s) and Sedge Warbler *Acrocephalus schoenabaenus* (9 pairs in this survey; 40 pairs in 1978) (Roberts, 2019).

Another headline figure that can be easily taken from this study is the overall number of breeding birds in the study area. 67 were recorded as holding territories during the surveys, which is consistent with the number of breeding species (63–66) recorded by volunteers on the sites (Carroll, 2016; 2017; 2018; 2019; 2020) each year. The number of breeding birds picked up during this 5 year study being larger than any of the individual years is purely down to chance rather than extra ones being detected. The survey areas just happened to have birds that might have bred in one year but not others, but this also works the other way as Cuckoo *Cuculus canorus* was not picked up with this breeding bird survey as its nesting behaviour makes it hard to detect using this method. The overall number of breeding birds is used by the YWT reserves staff to indicate change over time (along with several other measures), so is seen as a significant metric. The ones that breed vary from year to year to a small extent but the bulk of the birds remains the same. Small numbers of birds that are not permanently resident on site (such as Cuckoo, Spotted Flycatcher *Muscicapa striata* and Grasshopper Warbler *Locustella naevia*) and that may only have a single pair on site have bred in some years and not others, and this is to be expected. Now there are also data on the number of territories for each bird, key species could also be picked out as indicators of the health of the sites rather than an overarching 'number of species breeding' metric that may mask declines such as that of the Willow Tit.

The numbers of Dunnock *Prunella modularis* (60 territories) and Reed Warbler (80 territories) show the potential for Cuckoo to use the sites (these are two of the favoured birds parasitized by Cuckoo; the other common host, Meadow Pipit *Anthus pratensis*, is not present in the study area). However, as mentioned, Cuckoo was not picked up using this survey method although it is thought to have bred in most of the years of the survey, although the host is not known.

The data collected can also be used to look at breeding density (how close together the breeding territories are); this is best shown as a heat map with darker colours indicating where more territories overlapped. Due to the mapping method this can be done with a fair degree of accuracy (compared to other maps discussed later). Figure 2 p108 shows also the extent of the survey (the northern blocks, mostly cut off by railways, were not surveyed), as all areas surveyed had some degree of occupancy by birds and are therefore coloured; the unsurveyed areas are blank.

This map shows that breeding territories are not evenly distributed across the sites (there is not a uniform colour). This is to be expected as the habitat varies from broadleaf woodland to grassland and from reedbed to open water. Comparing Figure 2 to the very broad habitat types shown on the OS map of Figure 1 (p104) gives some idea of changes across the site. This, taken with the detailed knowledge of the site by the authors, allows some trends to be discerned. Lakes are variably coloured, islands in lakes can be home to several territories and some lakes have Black-headed Gull colonies or large numbers of other wetland birds such as Greylag *Anser*

anser or Canada Geese *Branta canadensis*. The very darkest areas correspond to these islands and often with gull colonies. Gull nests can be counted but their true territory would be much larger, as they forage over a large area, giving a slight quirk of the survey, as the darkest heat spot could also be shown as covering a much larger area. Grassland areas have few ground nesting birds (low density) whereas hedges, scrub and woodland tend to have greater densities (but not as great as wetland areas). It appears that woodland edges are important; so scrubby edges of lakes and the recent coppice coupes in Beeston Plantation and hedges appear as darker areas (although it is possible there is some bias in the method, as these edges are often also the transect routes).

Although this heat map is interesting, it does not tell us anything about the birds that are breeding in high densities in these areas. However, knowing the natural history of the birds present and the fact that the top 7 accounted for over half the territories, leads us to conclude that the darkest areas in woodland edge type habitats are likely to be woodland edge/garden birds such as Wren, tits and some of the commonest warblers such as Blackcaps and Chiffchaffs *Phylloscopus collybita* (this is backed up by a close interrogation of the data on GIS). This is not to understate the value of these species, which form an important function in the ecosystem. They allow species higher up the food chain to prosper, such as Sparrowhawk *Accipiter nisus* and other predators, and provide a control on invertebrates that feed on vegetation in their preferred habitat. Similarly, it is only by looking at the details of the data on GIS that you can see the composition of the dark wetland spots (as mentioned above).

To assess how well a nature reserve is managed, using species with more specific needs or that have declined significantly in the wider countryside due to change in management or other factors, may be more enlightening. The red and amber lists of bird species are lists of those that have declined the most. The criteria for selection as a red list species (RSPB, 2015) includes:

- Species that are globally threatened.
- Historical population decline in UK during 1800–1995.
- Severe (at least 50%) decline in UK breeding population over last 25 years or longer-term period (the entire period used for assessments since the first BoCC review, starting in 1969).
- Severe (at least 50%) contraction of UK breeding range over last 25 years or the longer-term period.

Only 9 birds on the red list were found in this survey (Table 2, p108) but many more amber list birds were recorded. There are at least 3 further red list birds known or suspected of breeding on site or using the sites as part of their territories at least once during the survey period (Lesser Spotted Woodpecker *Dryobates minor*, Cuckoo and Spotted Flycatcher); of these, Cuckoo is the only one to have bred in most years of the 2015-19 survey period.

Given the rarity of red list birds both nationally and on site (61 territories out of 1633), the heat map of red list territories does not have the darker heat spots of map 2. It does, however, highlight the areas that are important for these birds. Figures 3 and 4 (p109) look more 'blocky' than Figure 2 as, with fewer territories, the data do not give as interesting results when viewed at a finer scale.

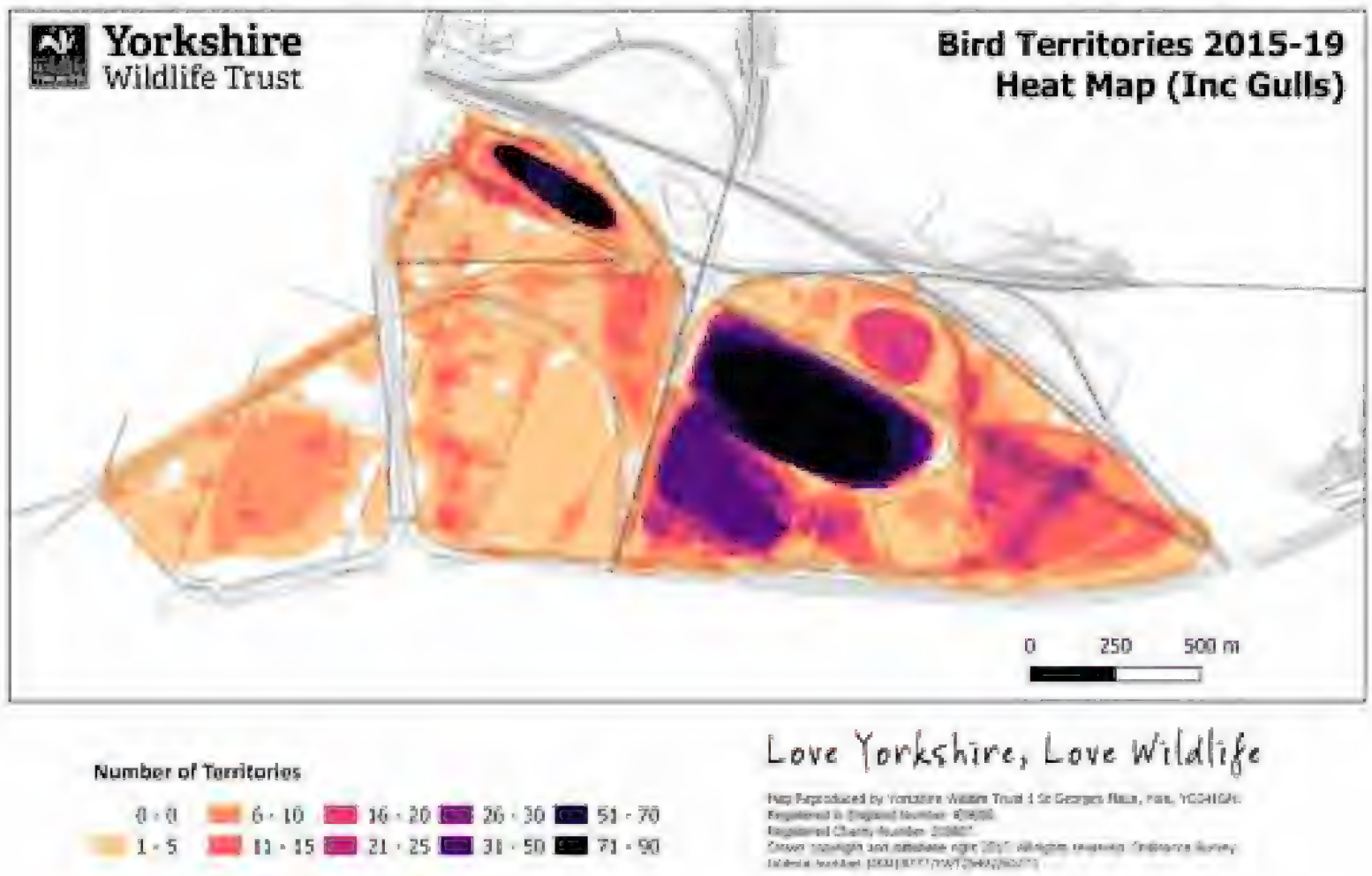

Figure 2. Heat map of territories of all birds.

Table 2. Red list birds and the number of territories in the study area.

Red list species	Territories
Pochard	23
Lapwing	12
Song Thrush	12
Skylark	4
Mistle Thrush	3
Willow Tit	2
Starling	2
Yellow Wagtail	2
Linnet	1

The darker areas for red list birds (Figure 3) are wetlands but also highlighted are a woodland, scrub and some wet grassland; although the site contains a number of each of these, it is noticeable that the darker areas are the largest expanses of wetland (Huxterwell Marsh). There is a temptation when creating or managing a nature reserve to have as many habitat types squeezed in as possible, but this shows that some birds require larger expanses of the same habitat type, or perhaps just larger sites of semi-natural habitat.

The heat map of amber and red listed birds combined (Figure 4) shows some hot spots but most of the site has a degree of colouration. This shows that the site in general is important for declining birds, but some areas are more important (hot spots) with the most significant

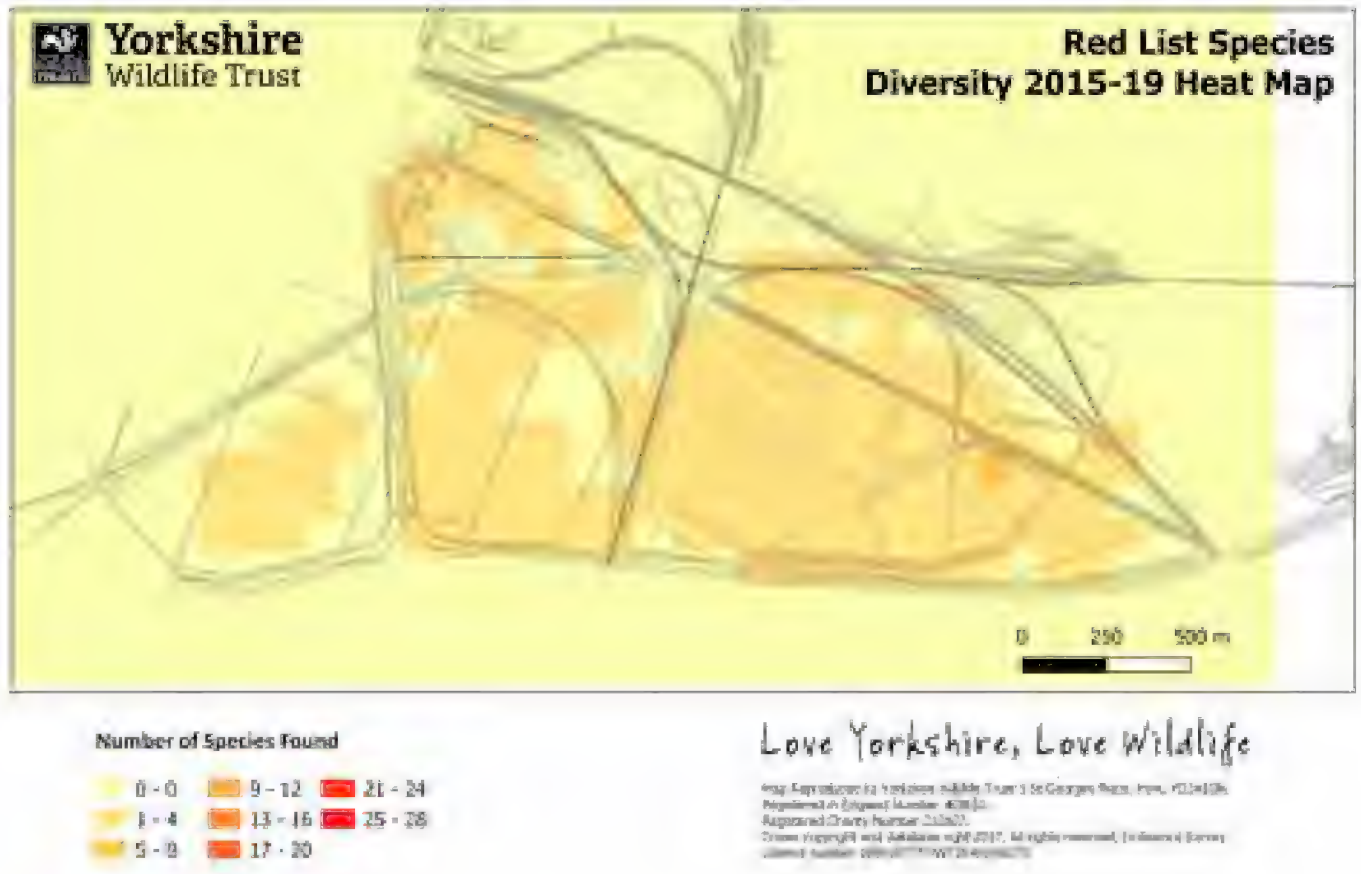

Figure 3. Heat map of red listed species

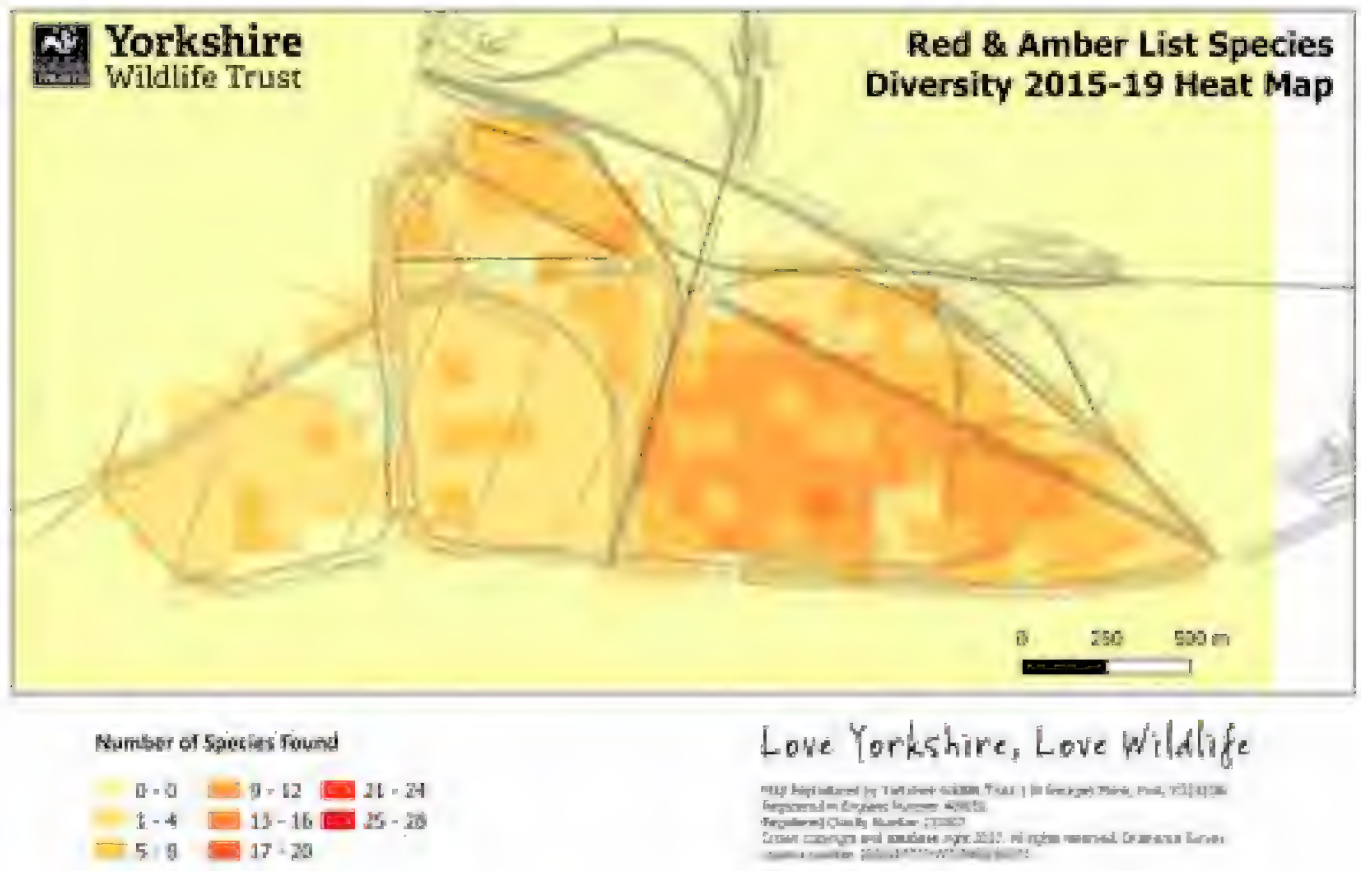

Figure 4. Heat map of red and amber listed species

being part of the large wetland area known as Huxterwell Marsh and the two lakes at Decoy Marsh/Old Eaa. Huxterwell Marsh is less than 20 years old so long establishment of a habitat is not always required, but again it is presumed that the proximity of large blocks of open water and reedbed are conducive to red and amber list birds. Having large blocks of similar habitat

appears to be good and, because this is often missing from the wider countryside, it may be a factor in the decline of the red and amber listed birds nationally.

The data were looked at for both species richness and for species diversity (using the Shannon index). Both gave similar maps, so only the species richness map is included here (Figure 5, p112). Species richness (essentially counting the number of species whose territories overlap in a single 100m x 100m square) gives a useful view of which areas are the most diverse. One of the hot spots from Figure 2 (heat map of all species territories) has become less distinct here, as many of the territories are Black-headed Gull. So it has a large number of territories here but few species.

The darker spots coincide closely with the hot spots of the territories heat map (Figure 2, p108), which is perhaps not surprising, because where there are more birds there is more likely to be greater species diversity. However, there is a slightly more even colour across the site (not the very dark hot spots of the gull and other wetland bird colonies on islands in lakes). The darkest spots of Figure 5 p112 are often edges of habitats, and many are roughly where grassland, woodland and wetland birds could all have overlapping territories. So counter to the argument for large blocks of similar habitat supporting the more endangered birds, having lots of different habitats in close proximity gives the greatest species diversity (though not necessarily rare or declining species).

Discussion

As mentioned above, other less formal methods of surveying numbers of breeding birds on site are undertaken by staff and volunteers, although this is done for Potteric Carr mainly with little volunteer effort on Carr Lodge. These more *ad hoc* surveys have highlighted birds that have bred at Potteric Carr but were not picked up using the formal method employed for this study, including Grasshopper Warbler and Cuckoo. These annual lists of breeding birds are a good check against which to measure the veracity of the data presented here; both for overall number of birds and also a check on hard to record ones such as Bittern. However, numbers of territories are not always recorded. Presence/absence are useful pieces of data but more useful are specifics such as: has the number of Redshank *Tringa totanus* territories gone up/down over time? So continuation of both the *ad hoc* and formal surveys presented here is considered important for a better understanding of Potteric Carr and Carr Lodge Nature Reserves.

As sites with good numbers of red and amber listed birds it is important to know where and how many of these we have. The mapping of these has shown that large areas of habitat are significant, so retaining these (rather than trying to squeeze in fragments of other habitats) is important. Given the precipitous declines of some of these bird, this would be a higher priority for future management than creating pure species richness.

Another factor influencing the red and amber birds may be active management; all the hotspots on Figure 4 are areas where active management (grazing, coppicing, reed cutting etc.) has been undertaken during the survey cycle. There is some pressure within conservation circles for a more hands off, 'rewilded', approach. Any movement towards this must be carefully considered and monitored; the extreme end of rewilding is not considered appropriate for Potteric Carr and Carr Lodge.

There are a number of blank spots on the maps (the red lines of Figure 1 indicate the YWT boundary and some areas have no data); in an ideal world these would be added to the surveys (making the survey cycles longer than 5 years). This seems unlikely to change in the next cycle of surveys, but when the opportunity arises it should be taken.

YWT's nature reserves in the area seem set to increase with the completion of mitigation land for a large development (iPort). If this land can be secured, and put into good conservation management then the number of red and amber listed birds and the number of territories should similarly increase. An increase in numbers of pairs in the area could have an impact on numbers of eggs raised to fledging, as larger colonies have more successful breeding (McDonald and Bolton, 2008), creating a greater effect. Although 10 years old now, John Lawton's recommendation for better, bigger, more and joined up wildlife areas (Lawton, 2010) is still an important mantra for nature conservation.

The impact of the iPort land is seen in these data. Following the method set out an Avocet *Recurvirostra avosetta* territory was shown up on Potteric Carr but, in actual fact, the nest was on the iPort land, but Potteric was a major feeding ground for the birds (there was more than one Avocet nest on iPort but applying the method only highlighted 1 pair). As with the issue around how to show the Black-headed Gull colonies, this shows the limitation of this method. However, following a set method does make it repeatable and errors will be the same in future years. There is no perfect way to monitor change over time so being aware of issues like this only helps to interpret the data, and does not make those data redundant.

Conclusions and recommendations

This survey is interesting but perhaps the most useful data will come in 5 or 10 years time, when repeats of the surveys will allow comparison over time and will also allow assessment of interventions, changes in management or other external factors. Comparing the 1633 breeding territories of 67 birds species with future numbers, as well as the more detailed comparison of individual bird numbers, will help to see if the sites are well managed for birds.

It could be said that these data are already intuitively known by the staff and long-standing volunteers at Potteric Carr and Carr lodge, and so it is. However, staff do not stay in their jobs forever, nor do volunteers. Nor is the intuitive knowledge always correct, perfectly remembered or free of bias to favour certain birds. So to create a long term record that will be useful for decades to come, the only option is a methodical survey.

Looking at the data, we can pull out a number of potential conservation interventions that could help those birds that are not numerous, but that could possibly be more so:

- Putting a Kestrel *Falco tinnunculus* box on Carr lodge could immediately double the number of territories
- Predator fencing of ground-nesting birds could help to increase breeding success, leading to more birds and higher densities and therefore an even higher rate of raising chicks to fledging (a virtuous circle?)
- Predator control/culling to increase ground-nesting bird success

Although it is easy to suggest conservation measures, not all of them are cheap, easy or desirable to implement. A kestrel box is uncontroversial; there are not enough old trees to

provide natural sites and there should be minimal impact from an extra pair of this predator (perhaps some competition with other predators that feed on voles such as Barn Owl and Fox *Vulpes vulpes*). Predator control is much more controversial; although employed by some conservation organisations it is not considered appropriate at Potteric Carr and Carr Lodge. Predator fencing seems less controversial but the cost is high. The cost of installation is 5-6 times that of a normal stock fence and requires mowing several times a season to stop grass from short circuiting the electric fencing and the effect of predator fencing often reduces after a few years. This is not something that could be implemented immediately and a careful cost benefit analysis would need to be done (including the impact on mammalian predators and the potential ineffectiveness of the measure given the number of Marsh Harriers *Circus aeruginosus* in the area etc.).

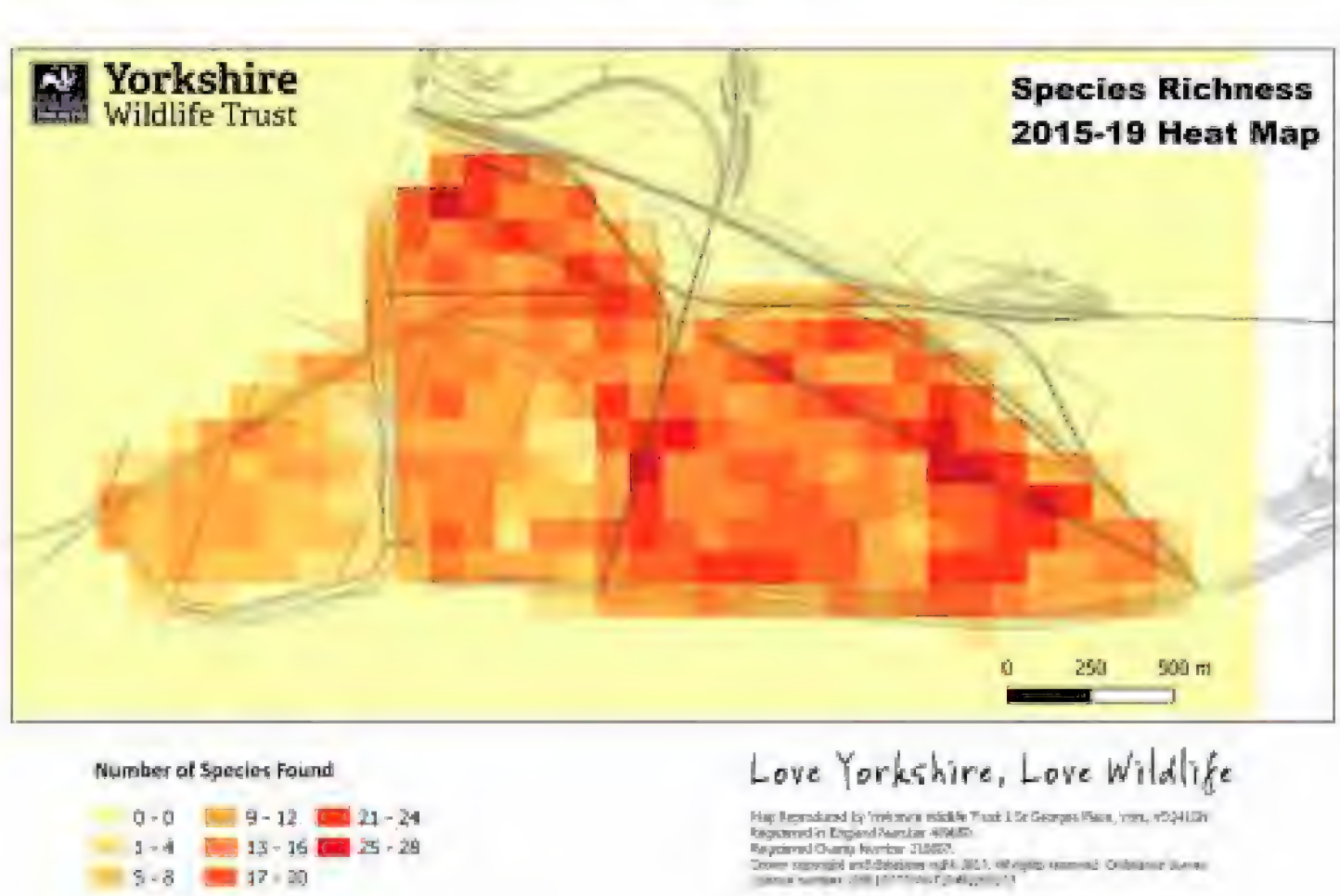

Figure 5. Map showing species richness

Action could also be taken to benefit red data book birds that are currently not present, or not breeding every year. For example:

- Planting of more hedgerows to encourage Yellowhammer *Emberiza citrinella* and Grey Partridge *Perdix perdix*
- Retention of as much standing dead wood as possible (or perhaps even creating it) for Lesser Spotted Woodpecker
- Control of deer to enable better tree regeneration, creating better understorey in woods for Nightingale *Luscinia megarhynchos* (there was at least one pair in Doncaster until recently) and several warblers.

As sites with fairly mature habitat, planting hedgerows is not going to be possible at any scale on Potteric Carr and Carr Lodge without conflict with other habitats/species. However, with the potential acquisition of more land nearby in 2021 (iPort wetlands) there may be potential for more hedgerows there. Yellowhammer, a hedgerow bird, is already present there too, so

it is perhaps a better choice of location for new hedgerows. Retaining dead wood is already undertaken but creation of more (by killing standing trees) is possible and should be considered. Control of deer is again another thorny ethical issue; the benefits have been known for years (Forestry Commission, 1999; Fuller and Warren, 1993; Fuller et al, 2010) but culling deer is controversial, especially in a suburban setting and when people might lack an understanding of the negative impact too many deer can have.

The main recommendation is therefore to continue to collect breeding bird data in this methodical manner (and similarly to continue to collect the complementary *ad hoc* data) alongside management of the sites. The interest and use of the data will grow over time. Wildlife is still under threat and declining in the UK and the impacts of the wider countryside (for example extinction deficit) are still affecting nature reserves. Good practice in the management of nature reserves is well documented, but some management needs to be site specific, so we should assess if what we are doing is working through survey and monitoring. The better we understand our wildlife the better placed we are to conserve it (and hopefully allow its spread back into the wider landscape).

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The moth fauna of Askham Bog

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Introduction

Askham Bog (SE5647/SE5748) is a small (46ha) valley mire just inside the York ring-road and 5km SW of York Minster. For its size, it is one of the most species-rich sites in Yorkshire (Fitter, 2019) and its survival in a peri-urban setting is remarkable. It has been known for 200 years for its exceptional flora and invertebrate fauna, including numerous nationally significant rarities, and was included in the original 'Rothschild list' of 1913 that outlined potential national nature reserves in Britain (Sands, 2012). More than 3000 species have been recorded from Askham Bog, over 5% of all UK non-microbial species. The site is an SSSI, owned and managed since 1946 by the Yorkshire Wildlife Trust, whose careful stewardship has seen a marked improvement in its ecological status.

The biota of Askham Bog has been unusually well-studied and documented (Fitter & Smith, 1979). The earliest record is of Bog Myrtle *Myrica gale* in 1789 and there are herbarium records from the first decade of the 19th century. The most important historical document, however, is the series of articles in 1879 in *The Natural History Journal*, published by the various Friends' (Quaker) Schools, one of which, Bootham School, was (and still is) in York. To have a detailed account of the natural history of a site dating from 140 years ago is exceptional.

The list of Lepidoptera in the 1879 publication was compiled by William Prest (1879), a very active York naturalist (Mayhew, 2020), largely from personal observation, and his records were a major part of the detailed Yorkshire list compiled by Porritt in 1883 (Frost, 2011). We therefore have a good indication of the moth fauna (the butterfly fauna is relatively modest) at that time, although the geographical definition of 'Askham Bog' was broader then than now: the adjacent 'marshy fields' are now agricultural or a golf course and a significant area known as Challoner's (or Chandler's) Whin, east of the Bog and renowned as the key area for the exceptional water beetle fauna, was destroyed in the 1950s, having been selected by York City Council for dumping domestic refuse.

From the records published by Prest and Porritt, and taking into account changes in taxonomy since the 19th century, our best estimate is that 299 moth species had been recorded at Askham Bog by 1883. The records were largely of macromoths but included Crambidae and Pyralidae, and would have been recorded by the techniques then available, notably netting, sugaring and hunting for larvae, eggs or feeding signs, although light was also used. At the end of his account of the macromoths of Askham Bog, Prest (1879) states that he has an equivalent list of micros that he would like the editor of the journal to publish, but sadly that offer was not taken up and the list has not been traced.

Over subsequent years naturalists added further records, so that by the end of 2018 a total of 485 moth species had been recorded. Although a respectable total (over 20% of the 2418 extant species on the British list: Agassiz *et al.,* 2013, 2020), people who regularly trap in suburban gardens in the York area can often accumulate lists of well over 600 species, suggesting that Askham Bog was under-recorded.

In 2019 and 2020, therefore, a small group visited the site on a number of occasions using a range of techniques, including Robinson/mercury vapour traps (run from a Honda EU10i generator), Heath/actinic traps (run from both generator and battery), LED/battery traps, sugaring, netting and larval/feeding sign searches (Appendix 2, p125). In some cases, particular taxa were targeted for larval searches. All trapping and searching took place within the SSSI boundary. Trapping only occurred on nights when the weather was deemed favourable.

Species recorded

We recorded 332 species at Askham Bog in 2019 and 439 in 2020 (Table 1, p116). In 2019, 122 of those were new to the site list and in 2020 there were 95 new species, raising the total site list to 607 in 2019 and 702 in 2020. Many of these were micro moths which were historically under-recorded and some would surely have been on William Prest's lost list. These numbers suggest that we now have a much better understanding of the diversity of the moth fauna at Askham Bog.

The list we started with in 2018 included 102 species (out of the total of 485) that had not been recorded since Porritt (1883), raising the question of whether they were still present: these species are referred to here as 'lost' species. Some of these lost species are widespread late autumn (e.g. *Agrochola* and *Epirrita* spp.) or early spring (e.g. *Orthosia*) moths, suggesting that there may simply have been no recorders active at the appropriate time in the intervening period. That is the case certainly for the late autumn ones, most of which were recorded in 2019 or 2020; however, national pandemic lockdown restrictions in 2020 meant that for the *Orthosia* (and similar early spring) moths there was no opportunity to record their possible presence.

During 2019 and 2020, 28 (27.5%) of these 102 'lost' species were recorded (Table 1, p116), leaving 74 not recorded since 1883 (Table 2, p117). If the same rate of re-discovery were maintained then a further 20 species (27.5% of 74) might remain to be re-found. This estimate is clearly subject to numerous assumptions and should not be taken as a prediction. However, some of the lost species have declined severely in the UK, in some cases to extinction, and therefore the remaining lost species have been classified into six categories ranging from Overlooked to Impossible (Table 2; species list in Appendix 1, p123). The last category includes moths that are either presumed extinct or extremely rare, and the first category includes ubiquitous ones such as the *Orthosias.* Allocation to each category was based on information on local distribution, habitat and food plant availability.

During 2019 and 2020 we recorded 63% of the lost species classified as Overlooked and 35% of those regarded as Probable, but only 18% of the Likely species and none of the Possible, Unlikely or Impossible species (Table 2). These categorised rates of re-discovery were used as estimates of the probability of persistence for each category of species, in order to estimate the number that might still be present (Table 2). On that basis a further 14 species would

be expected to be still present, suggesting that around 60 (=74-14) of the species recorded historically at Askham Bog are no longer present.

Table 1. Summary of moth records at Askham Bog, 2019-2020. Missing species are those that would be expected to occur based on local distribution, habitat and food plant, but had not previously been recorded. Lost species are those that had not been recorded since 1883.

Spp. recorded up to 1883 (mainly macros – 26% of UK species list[1])	299
Spp. recorded before 2019 (macros and micros – 20% of UK species list)[2]	485
Spp. recorded in 2019	332
Spp. added to list in 2019 of which 89 (73%) were 'missing' spp.	122
Spp. in 2019 not recorded since 1883 i.e., 'lost' spp.	20
Species recorded by end 2019 (25% of UK species list)[2]	607
Spp. recorded in 2020	439
Spp. added to list in 2020 of which 60 (63%) were 'missing' spp.	95
Spp. in 2020 not recorded since 1883 i.e., 'lost' spp.	8
Species recorded by end 2020 (29% of UK species list)[2]	702

[1] The percentage is calculated from the current list including all macro families plus Pyralidae and Crambidae. The list in 1883 may have been smaller, so that this may be an underestimate of the true value.
[2] Based on current UK list of all moth species.

Similarly, it is possible to compile a list of 238 moth species that are likely to be found at the site because of local distribution and presence of the appropriate habitat and food plants, but had not been recorded prior to 2019, referred to here as 'missing' species. Of the 122 species added to the site list in 2019, 89 (73%) were in this sense missing from the list; and of the 95 new species in 2020, 60 (63%) were missing (Table 1). The current 'missing' list includes 89 moths.

Table 2. Number of species not recorded at Askham Bog after 1883 at the end of 2018 (before the current trapping campaign) and numbers of those re-recorded in 2019 and 2020. Species have been allocated to six categories of likelihood based on local distribution, habitat and food plant. P_{pers} is the probability of persistence estimated from the fraction of species in each category re-found over the 2 years of trapping. 'Future' represents the number of remaining species likely to be found on that basis, as the product of the numbers remaining unrecorded at the end of 2020 and the probability of persistence.

Category	Unrecorded 1884-2018	Recd in 2019	Recd in 2020	Not yet re-recorded	P_{pers}	Future
Overlooked	30	14	5	11	0.63	7
Probable	20	5	2	13	0.35	5
Likely	11	1	1	9	0.18	2
Possible	20	0	0	20	0.00	0
Unlikely	16	0	0	16	0.00	0
Impossible	5	0	0	5	0.00	0
Totals	102	20	8	74		14

Projecting the true diversity

In the last two years, recording has added 217 moths to the site list, 149 of which were on the 'missing' list, leaving 68 (32%) as, in that sense, unexpected (Table 1). Predicting how many 'unexpected' species may be recorded at the site in future is more challenging. Nevertheless, the rate of discovery remains high: similar numbers of unexpected species were recorded in 2019 (33) and in 2020 (35).

A striking feature of the data is the large number of species recorded given the scale of activity. In 2020, trapping occurred on 25 nights, with a total of 55 trap-nights (Appendix 2), and 4291 individual moths were recorded of 419 species (the remaining 20 species shown in Table 1 for 2020 were recorded as larvae or leaf mines). That ratio – 1 species for every 10 individuals – is unusually high. A comparison with an identical trap in a garden in Huntington (SE613556), 10 km away, which was run on the same nights as at Askham Bog, demonstrates that the species:individuals ratio at the Bog is indeed high (Figure 1a, p118): the rate of accumulation of species with increasing total catch is far greater at the Bog than in the garden.

One possible explanation of the difference in species accumulation rates at the two sites is that the garden moth fauna may be dominated by moth species associated with human-altered and disturbed environments. Although this domination does occur – five species (Heart & Dart *Agrotis exclamationis,* Large Yellow Underwing *Noctua pronuba,* Square-spot Rustic *Xestia xanthographa,* Dark Arches *Apamea monoglypha* and Uncertain *Hoplodrina octogenaria*) between them accounted for 656 (26%) of the 2485 moths trapped in Huntington on the 14 nights examined but only 53 (3%) of the 1702 moths at Askham Bog – removing these species from the analysis reduces but does not eliminate the difference between the sites (Figure 1b, p118).

It would be possible to fit curves to these data and extrapolate from them to estimate the total species pool, were there to be more intensive trapping, but no statistical model fits the data sufficiently closely for such an extrapolation to be reliable. Nevertheless, the fact that the species accumulation curves for Askham Bog in Fig. 1 show no sign of levelling off as more

moths are caught, combined with the sustained discovery rate of new species, suggests that its moth fauna is unusually rich.

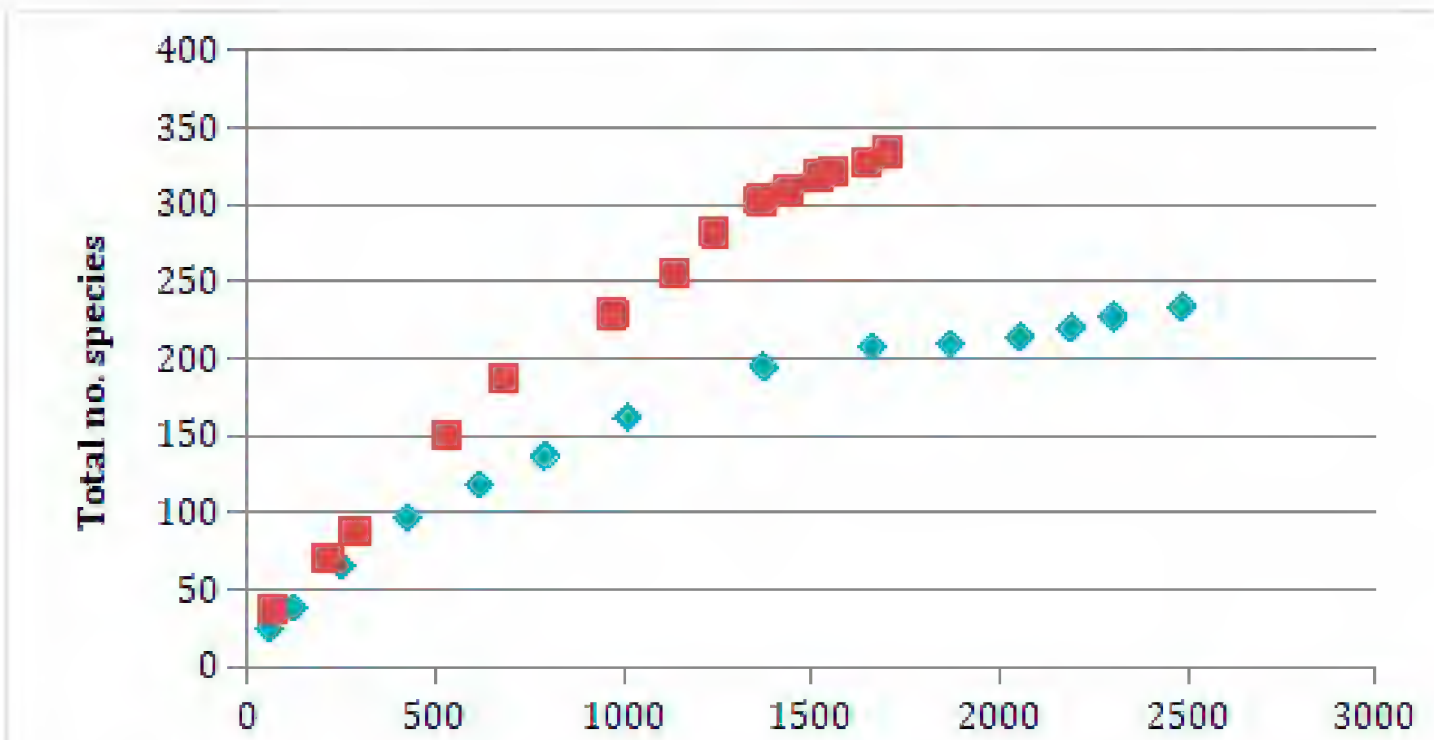

Fig. 1a

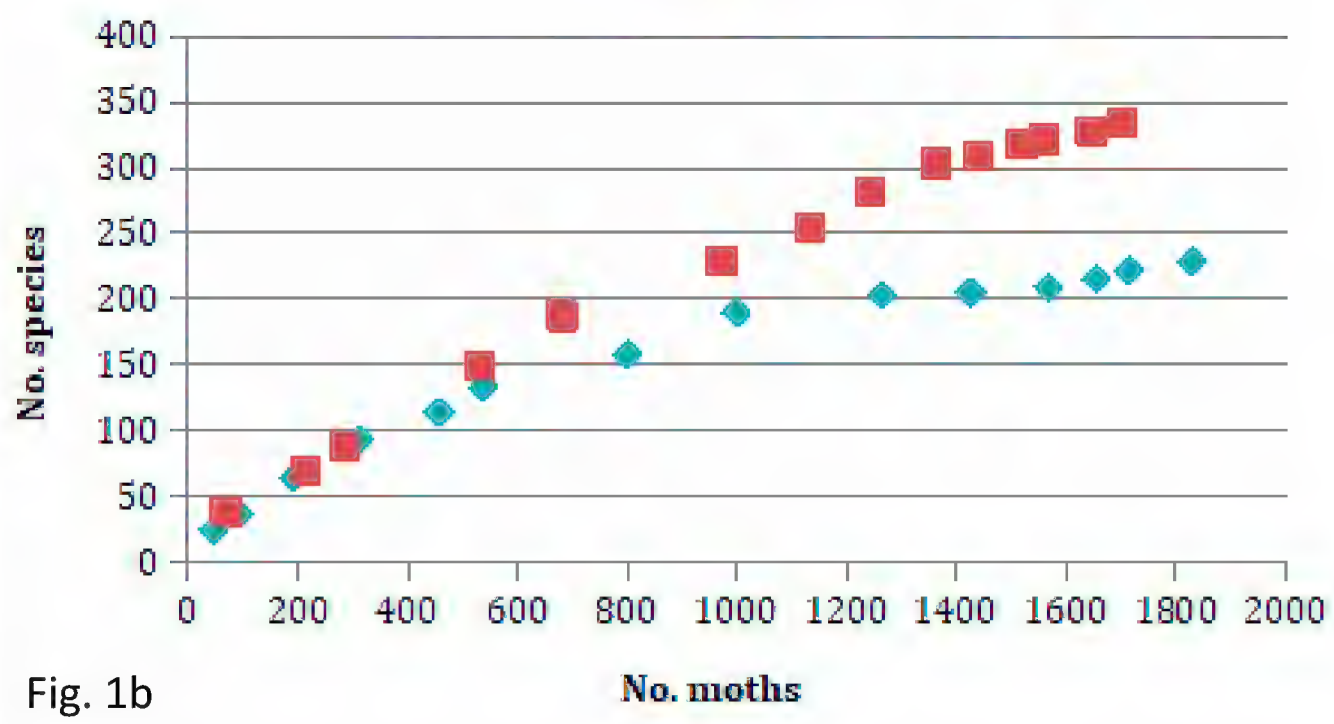

Fig. 1b

Fig. 1. (a) Species accumulation curves for Askham Bog (squares) and a suburban garden in Huntington (diamonds); (b) the same data but omitting the five most abundant species in the garden site, viz. *Agrotis exclamationis, Noctua pronuba, Xestia xanthographa, Apamea monoglypha* and *Hoplodrina octogenaria.* The two sites are 6 miles apart and data are for the 14 nights in 2020 when an MV trap was operated at each site. It is possible to fit a power function regression to these data (giving lines of best fit as $y=1.68x^{0.72}$ for Askham Bog and $y=2.34x^{0.60}$ for Huntington Road, confirming the differences between the two sites; however, as stated in the text, deviations from this fit at high values of x mean that such an approach cannot be used predictively.

Individual taxa

As pointed out above, 149 of the 217 species added to the site list in 2019-2020 were 'missing', in the sense that they would be predicted to be present on the basis of local distribution and habitat. It follows that around a third of the new species were less likely to be discovered and indeed numerous regionally significant species have been recorded at Askham Bog over the last two years. Further details of these can be found in the Annual Reports published by the Yorkshire Naturalists' Union and Butterfly Conservation Yorkshire in the journal *Argus* (Beaumont *et al*., 2020, 2021), but an overview of these additions is given here.

Dentated Pug *Anticollix sparsata* is the only Nationally Scarce A species known to occur at present. It is strikingly abundant and at the peak of the flight season in early June can be the most numerous moth on the wing at or shortly after dusk. Its food plant, Yellow Loosestrife *Lysimachia vulgaris*, is widespread and common at Askham Bog and the population seems secure.

Nine species graded Nationally Scarce B have been added to the site list in 2019-2020, namely *Bohemannia quadrimaculella, Blastodacna atra, Stathmopoda pedella, Epinotia sordidana, Apotomis semifasciana*, *Gypsonoma oppressana,* Devon Carpet *Lampropteryx otregiata,* Angle-striped Sallow *Enargia paleacea* and Cream-bordered Green Pea *Earias clorana.* In addition, Valerian Pug *Eupithecia valerianata* has been reconfirmed at the site, not having been recorded since 1984, itself the first record since 1883.

Among species graded Local that have been added, the most significant ones in respect of their regional distribution are: *Coleophora ibipennella, C. binderella, Elachista subalbidella, Epinotia cruciana, Stenolechia gemmella, Parachronistis albiceps, Aethes beatricella, Phalonidia manniana*, Small Scallop *Idaea emarginata,* Black Arches *Lymantria monacha* and Marbled Brown *Drymonia dodonaea*. Several other moths graded nationally as Local have been added to the list but in all cases are known to be already widespread or expanding locally.

There have, however, been recent apparent losses. The other nationally Scarce A moth that has been recorded recently is Marsh Carpet *Gagitodes sagittata*, recorded on nine occasions between 1978 and 2011. All but two of the records were of larvae. In that period the population was clearly well sustained but, despite careful searches for larvae in both 2019 and 2020, no more recent records exist. This moth lays eggs on the flowering heads of Common Meadow Rue *Thalictrum flavum*, and the larvae feed on the seeds. There is anecdotal evidence that Common Meadow Rue is less abundant than formerly but, perhaps more significantly, clear evidence that fruiting spikes of the plants are now heavily grazed by Roe Deer *Capreolus capreolus* which have increased in abundance recently. However, Marsh Carpet is a moth known to be 'subject to extreme fluctuations in population size' (Waring *et al.,* 2017) and may yet re-appear.

Argent and Sable *Rheumaptera hastata* is another Nationally Scarce B moth that may have been lost from the site, although there appears to be an abundance of food plants and appropriate habitat. The record is curious: it was first seen in 1950, though the record is not sourced, and subsequently in 1982, 1984 and 1986 by two well-known York lepidopterists (S.M. Jackson and J. Payne). It is very unlikely that such a conspicuous diurnal moth would have been missed by 19th century naturalists, so it appears to have colonised in the mid-20th century, possibly from its nearest extant site at Bishop Wood, 13 km south. However, at that time, prior to the start of

conservation management, much of the site was densely wooded and the habitat would have been less suitable; curiously, the moth was last seen just at the time when management had started to create good areas of habitat.

Food plants

The food plants of all moth recorded at Askham were determined from several sources: Langmaid *et al.* (2018); the Phytophagous Insect database (Biological Records Centre: http://www.brc.ac.uk/dbif/homepage.aspx); and the HOSTS database (Natural History Museum: https://www.nhm.ac.uk/our-science/data/hostplants/). Moths were counted as polyphagous if they used >3 genera of plants currently recorded at Askham Bog; there were 263 polyphagous moth species and eight for which food plants were unknown.

Table 3. Food plants of moths recorded at Askham Bog. Numbers are of recorded moths for each plant, excluding polyphagous moths. Plants with <3 associated moths are not listed: 24 plants had 2 associated moths and 33 plants had 1 moth.

Trees and shrubs and other woody species	**No. spp.**	**Herbaceous species**	**No. spp.**
Salix cinerea	49	*Galium palustre*	11
Betula pubescens	47	*Juncus* spp.	9
Quercus robur	36	*Centaurea nigra*	8
Populus tremula	33	*Cirsium palustre*	8
Alnus glutinosa	28	*Urtica dioica*	7
Crataegus monogyna	19	*Angelica sylvestris*	6
Corylus avellana	18	*Phragmites australis*	6
Malus domestica	13	*Arctium minus*	5
Prunus spinosa	12	*Trifolium repens*	5
Rosa canina	12	*Epilobium hirsutum*	4
Lonicera periclymenum	8	*Phalaris arundinacea*	4
Rubus fruticosus	8	*Silene dioica*	4
Acer pseudoplatanus	7	*Vicia cracca*	4
Myrica gale	7	*Anthriscus sylvestris*	3
Fraxinus excelsior	6	*Cirsium vulgare*	3
Sorbus aucuparia	6	*Glyceria maxima*	3
Fagus sylvatica	5	*Heracleum sphondylium*	3
Ribes nigrum	4	*Iris pseudacorus*	3
Ulex europaeus	4	*Jacobaea vulgaris*	3
Frangula alnus	3	*Lotus pedunculatus*	3
Rhamnus cathartica	3	*Molinia caerulea*	3
		Plantago lanceolata	3
		Sparganium erectum	3
		Typha latifolia	3

The most frequently used food plants for Askham Bog moths were all trees (Table 3). Of the 45 most frequently used plants only Gorse *Ulex europaeus* does not grow currently within the SSSI boundary but it is abundant within a few hundred metres. Strikingly, the 702 moth species at Askham Bog only use 102 of the 231 plant species currently recorded as growing within the

SSSI boundary, reflecting the general food plant preferences of Lepidoptera (Narango *et al.*, 2020). That figure will be an underestimate as some of the polyphagous moths may use plants not otherwise listed; for example, *Elachista* spp. and many noctuids use a wide range of grasses and sedges.

The number of species with trees and shrubs as their food plant shows the importance of the wooded areas on the site for the moth fauna. The most frequently used herbaceous food plants are nearly all species of tall fen or fen woodland (e.g., Marsh Bedstraw *Galium palustre*, Marsh Thistle *Cirsium palustre* and Wild Angelica *Angelica sylvestris*).

Conservation implications

These data suggest that Askham Bog is a particularly rich site in terms of species of moths. The current list of over 700 species, which is nearly 30% of the UK species list, is high for a site that is only investigated sporadically; higher numbers are frequently noted at sites with regular trapping, such as gardens and permanently staffed nature reserves, but at Askham Bog 439 species were recorded in 2020 alone from 55 trap-nights and a number of visits searching for larvae and mines.

The total includes around 60 species recorded historically that are probably or certainly no longer present, but there are also nearly 100 species found locally that have not yet been recorded even though the habitat is suitable; it seems probable that many of the latter are in fact present. In addition, a significant number of moths were added in each of the two years that were not in this sense expected: 33 from 32 trap-nights in 2019 and 35 from 55 trap-nights in 2020 (Appendix 2, p125).

Those figures suggest that many moths remain to be recorded, a conclusion strengthened by the shape of the species accumulation curves in Figure 1, p118. The true moth species list for Askham Bog is likely therefore to be significantly greater than 700, further emphasising the importance of the site for its moth fauna.

There have been several proposals to develop the land to the north of Askham Bog in recent years, most recently in 2018, an application which was rejected at a Planning Inquiry in 2019. The main grounds for rejection were the very real prospect of disruption to the hydrology of the Bog were development to proceed (Fitter, 2019; Jones, 2019; Ministry of Housing, Communities and Local Government, 2020). The data presented here suggest that in any future application attention should also be paid to the likely impact of artificial lighting arising from housing development close to the Bog, since the moth populations are now revealed to be of high conservation significance and there is strong evidence that artificial lighting at night can depress moth populations (van Langevelde *et al*., 2017; Wilson *et al*., 2018).

Analysis of the food plant preferences of the moth fauna of Askham Bog shows that trees and shrubs predominate, with plants of tall fen and wooded fen also important. This pattern has implications for conservation management, since a major reason for the SSSI notification is the presence of threatened tall fen communities, notably those including Saw Sedge *Cladium mariscus*. Maintenance of such communities involves controlling the development of woodland, demonstrating the need for a balanced management approach in which a variety of habitat types is maintained, as is currently the case.

This paper demonstrates that the known biological richness of Askham Bog for a range of plant and animal groups extends to moths, which are accepted as excellent indicators of habitat quality (Randle *et al.*, 2019), and that future conservation plans will need to take into account impacts on the moth fauna.

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Appendix 1. Species not recorded at Askham Bog since 1883 ('lost' species), categorized by the probability of their occurrence now. Nomenclature follows Agassiz *et al*. (2013, 2020).

Code	Scientific name	Vernacular name	Likelihood
Species recorded in 2019 (n=20)			
3.001	*Triodia sylvina*	Orange Swift	Overlooked
35.018	*Hypatima rhomboide lla*		Overlooked
49.224	*Spilonota ocellana*	Bud Moth	Overlooked
63.067	*Eudonia lacustrata*		Overlooked
63.116	*Cataclysta lemnata*	Small China-mark	Overlooked
70.024	*Scopula imitaria*	Small Blood-vein	Overlooked
70.051	*Xanthorhoe spadicearia*	Red Twin-spot Carpet	Overlooked
70.144	*Pasiphila rectangulata*	Green Pug	Overlooked
70.183	*Eupithecia vulgata*	Common Pug	Overlooked
73.107	*Mormo maura*	Old Lady	Overlooked
73.121	*Gortyna flavago*	Frosted Orange	Overlooked
73.123	*Hydraecia micacea*	Rosy Rustic	Overlooked
73.134	*Rhizedra lutosa*	Large Wainscot	Overlooked
73.195	*Conistra ligula*	Dark Chestnut	Overlooked
63.052	*Nomophila noctuella*		Probable
70.036	*Cyclophora punctaria*	Maiden's Blush	Probable
70.138	*Perizoma flavofasciata*	Sandy Carpet	Probable
70.231	*Apeira syringaria*	Lilac Beauty	Probable
72.061	*Schrankia costaestrigalis*	Pinion-streaked Snout	Probable
72.036	*Nudaria mundana*	Muslin Footman	Likely
Species recorded in 2020 (n=8)			
70.107	*Epirrita dilutata*	November Moth	Overlooked
70.244	*Colotois pennaria*	Feathered Thorn	Overlooked
73.189	*Agrochola lota*	Red-line Quaker	Overlooked
73.190	*Agrochola macilenta*	Yellow-line Quaker	Overlooked
73.192	*Agrochola circellaris*	Brick	Overlooked
73.131	*Luperina testacea*	Flounced Rustic	Probable
73.254	*Cerapteryx graminis*	Antler Moth	Probable
73.188	*Agrochola helvola*	Flounced Chestnut	Likely
Species not yet re-recorded (n=74)			
63.018	*Eurrhypara coronata*		Overlooked
66.001	*Poecilocampa populi*	December Moth	Overlooked
70.086	*Electrophaes corylata*	Broken-barred Carpet	Overlooked
70.245	*Alsophila aescularia*	March Moth	Overlooked
70.247	*Phigalia pilosaria*	Pale Brindled Beauty	Overlooked
70.253	*Agriopis leucophaearia*	Spring Usher	Overlooked
70.255	*Agriopis marginaria*	Dotted Border	Overlooked

73.244	*Orthosia cerasi*	Common Quaker	Overlooked
73.245	*Orthosia cruda*	Small Quaker	Overlooked
73.247	*Orthosia gracilis*	Powdered Quaker	Overlooked
73.368	*Naenia typica*	Gothic	Overlooked
63.092	*Agriphila selasella*		Probable
70.032	*Cyclophora albipunctata*	Birch Mocha	Probable
70.066	*Earophila badiata*	Shoulder Stripe	Probable
70.067	*Anticlea derivata*	Streamer	Probable
70.087	*Cosmorhoe ocellata*	Purple Bar	Probable
70.103	*Lampropteryx suffumata*	Water Carpet	Probable
70.131	*Mesotype didymata*	Twin-spot Carpet	Probable
70.182	*Eupithecia assimilata*	Currant Pug	Probable
71.003	*Cerura vinula*	Puss Moth	Probable
73.095	*Caradrina clavipalpis*	Pale Mottled Willow	Probable
73.101	*Charanyca trigrammica*	Treble Lines	Probable
73.186	*Agrochola lychnidis*	Beaded Chestnut	Probable
73.213	*Ipimorpha subtusa*	Olive	Probable
70.101	*Colostygia multistrigaria*	Mottled Grey	Likely
70.119	*Philereme transversata*	Dark Umber	Likely
71.007	*Furcula bifida*	Poplar Kitten	Likely
73.171	*Litoligia literosa*	Rosy Minor	Likely
73.183	*Cirrhia gilvago*	Dusky-lemon Sallow	Likely
73.246	*Orthosia populeti*	Lead-coloured Drab	Likely
73.253	*Tholera decimalis*	Feathered Gothic	Likely
73.261	*Polia nebulosa*	Grey Arches	Likely
73.307	*Peridroma saucia*	Pearly Underwing	Likely
49.229	*Epinotia caprana*		Possible
54.009	*Zygaena lonicerae*	Narrow-bordered Five-spot Burnet	Possible
62.034	*Acrobasis repandana*		Possible
63.016	*Anania fuscalis*		Possible
66.007	*Lasiocampa quercus*	Oak Eggar	Possible
66.008	*Macrothylacia rubi*	Fox Moth	Possible
70.025	*Scopula immutata*	Lesser Cream Wave	Possible
70.069	*Pelurga comitata*	Dark Spinach	Possible
70.076	*Hydriomena ruberata*	Ruddy Highflyer	Possible
70.092	*Eulithis mellinata*	Spinach	Possible
70.168	*Eupithecia nanata*	Narrow-winged Pug	Possible
70.215	*Macaria wauaria*	V-Moth	Possible
70.303	*Jodis lactearia*	Little Emerald	Possible
72.083	*Euclidia glyphica*	Burnet Companion	Possible
73.052	*Cucullia umbratica*	Shark	Possible
73.118	*Celaena haworthii*	Haworth's Minor	Possible
73.238	*Mniotype adusta*	Dark Brocade	Possible
73.248	*Orthosia opima*	Northern Drab	Possible
73.266	*Lacanobia suasa*	Dog's Tooth	Possible

73.320	*Agrotis clavis*	Heart and Club	Possible
50.001	*Cossus cossus*	Goat Moth	Unlikely
65.014	*Cymatophorina diluta*	Oak Lutestring	Unlikely
66.012	*Gastropacha quercifolia*	Lappet	Unlikely
70.123	*Triphosa dubitata*	Tissue	Unlikely
70.166	*Eupithecia simpliciata*	Plain Pug	Unlikely
70.199	*Pterapherapteryx sexalata*	Small Seraphim	Unlikely
70.288	*Cleorodes lichenaria*	Brussels Lace	Unlikely
71.028	*Clostera pigra*	Small Chocolate-tip	Unlikely
72.018	*Orgyia recens*	Scarce Vapourer	Unlikely
72.041	*Lithosia quadra*	Four-spotted Footman	Unlikely
73.026	*Deltote uncula*	Silver Hook	Unlikely
73.212	*Ipimorpha retusa*	Double Kidney	Unlikely
73.228	*Antitype chi*	Grey Chi	Unlikely
73.237	*Polymixis flavicincta*	Large Ranunculus	Unlikely
73.313	*Euxoa tritici*	White-line Dart	Unlikely
73.314	*Euxoa nigricans*	Garden Dart	Unlikely
73.165	*Apamea furva*	Confused	Impossible
73.208	*Xylena exsoleta*	Sword-grass	Impossible
73.259	*Polia bombycina*	Pale Shining Brown	Impossible
73.277	*Sideridis reticulata*	Bordered Gothic	Impossible
73.349	*Spaelotis ravida*	Stout Dart	Impossible

Appendix 2. Dates of recording at Askham Bog in 2019 and 2020. Numbers in the first three data columns refer to number of traps not number of trappers. LED were of three different types and used different traps. Numbers in the last three columns indicate that the activity occurred on that date, but not how many people were involved (i.e., records are aggregated).

Date	MV/ Robinson	Actinic/ Heath	LED	Sugar	Net	Larvae
2019						
24/5	2					
1/6	2	2				
17/6	1	1				
8/7	4	2	2			
25/7	2		2			
3/8	1					
5/8						1
8/8	3	1				
23/8	1					
30/8	2					
29/9	3	1		1		
6/11						1
Total 2019 (12 dates)	**21**	**7**	**4**	**1**		**2**
2020						
9/5					1	

20/5	2	2			2	
25/5	1					
2/6	2	1				
14/6	3	1	1		1	
24/6	3	3	1		1	
3/7	3	1	1			
16/7	3	2	1			
7/8	1					
10/8	3	1	1			
18/8					1	1
22/8	1					
3/9	1					
8/9	3	1				
13/9	1					
15/9	2	1				
21/9	1			1		
5/10	1			1		
10/10						1
16/10	1					
20/10	3			1		1
29/10	1					
3/11						1
9/11						1
17/11	1					
Total 2020 (25 dates)	**37**	**13**	**5**	**3**	**6**	**5**

Notes on the Medeterinae (Diptera:Dolichopodidae) of Yorkshire - a neglected sub-family?

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The five genera which comprise the dolichopodid sub-family Medeterinae are *Cyrturella* Collin, *Dolichophorus* Lichtwardt, *Medetera* Fischer von Waldheim, *Systenus* Loew and *Thrypticus* Gerstacker. (Chandler,1998). The first two are represented by single species which are not yet recorded in Yorkshire. They are minute (less than 1.5mm), and in Britain they are known from only a handful of sites in East Anglia (Drake, 2005 and 2007).

Medetera

Medetera are described by Assis Fonseca (1978 p.44) as follows: 'Medium small to very small flies, generally to be found on vertical surfaces such as smooth tree-trunks, walls or fences. They appear to be the most predatory group of the family, catching and feeding on a variety

of minute insects, their extraordinary ability to run at lightening speed forwards, sideways or backwards, ensuring easy capture of their prey'.

The rapid mobility of these tiny greyish flies makes them difficult to capture and, of course, those that are successfully stalked and triumphantly tubed are only the ones occurring at heights up to two metres or so – inevitably many will remain out of reach; occasional examples turn up when sweeping tree foliage or rank vegetation and others occur amongst the contents of flight-interceptor traps. The positive identification of some species can be difficult at best, and impossible for those specimens lacking taxonomically critical bits and pieces of their fragile anatomies. There are also long-standing doubts about the validity of some species, with the distinct possibility of synonymy in several cases. Hopefully, there will be a full revision of this genus in the not-too-distant future that will effectively settle these outstanding problems.

It appears that the pioneering Yorkshire dipterists ignored this genus, for the legendary Chris Cheetham, who prepared the county Diptera record cards for the YNU, made no personal entry for *Medetera* during his thirty or more years of active recording, which was c.1920-1950. The first Yorkshire *Medetera* record is of *M. petrophila* Kowarz from 'Allerthorpe' (VC61), August 1936, by a visiting Bristol dipterist, H.C.Audcent, who spent some time at Barmby Moor with Dr Fordham that summer (Fordham, 1937 p.150) and during his visit he added several species to the list of Yorkshire Diptera. The next *Medetera* records (*M. petrophila* and *M. petrophiloides* Parent) occur on the Spurn survey undertaken by members and colleagues of the Y.N.U. Entomological Section (Hincks, 1953 p.162) and a few years later several more were added from the Malham area, probably from the Entomological Section survey which followed the one at Spurn. The most common and widespread species, *M . truncorum* Mg. was not reported in the County until 1975 when Peter Skidmore took it at Cusworth Park (VC63). It was not until the mid-1980's that recording of the genus occurred more frequently, although almost always serendipitously!

At present there are thirty seven *Medetera* species listed as British (Chandler, op.cit.) twenty two of which have been recorded in Yorkshire. Six of these are known from only one site in the county, eleven are recorded from ten or fewer hectads and only five from more. The recorded distribution of the genus does in truth clearly reflect the distribution of dipterists and their collecting haunts!

The five most reported species are *M. truncorum* with records from more than fifty hectads across Yorkshire, ranging from Spurn in the south-east to Feldom in the far north-west. *M. jacula* (Fall.) from more than thirty widely scattered hectads comes second, followed by *M.impigra* Coll. from seventeen, *M. pallipes* (Zett.) from fourteen and *M. saxatilis* Coll. from eleven hectads.

In contrast, the six recorded from only one locality are *M. bispinosa* Negrobov from Cayton Bay (VC62), *M. borealis* Thuneberg from North Cliffe Wood (VC61), *M. excellens* Frey and *M. pinicola* Kowarz from Timble Ings (VC64), *M. jugalis* Coll. From Snake Hall Plantation (VC61) and *M. melancholica* Lundbeck. from Allerthorpe Common (VC61).

Of the remaining eleven species, nine have been recorded from between two and five hectads: *M. ambigua* (Zett.); *M. dendrobaena* Kowarz: *M. diadema* (L.); *M. inspissata* Coll.; *M. muralis*

Mg.; *M. nitida* (Macq.); *M. petrophila*: *M. petrophiloides* and *M. tristis* (Zett.). Finally, two species are recorded from between six and ten Yorkshire hectads: *M. abstrusa* Thuneberg and *M. micacea* Lw.

Clearly there is much scope for further attention to be paid to *Medetera* in Yorkshire; the challenges are considerable, not least being the necessity for good quality specimens being available for microscopic study!

Systenus

Five of the six British species of *Systenus* have been recorded in Yorkshire but all except one report have been the result of rearing. The first was *S. pallipes* (von Roser), of which two females were reared from debris collected by Peter Skidmore from an American Chestnut (*Aesculus* sp.) rot-hole at Cantley Park (VC63), emerging on 6 June 1975. From the same debris a single male *S. leucurus* Lw. emerged two days later (Skidmore, 1977 pp.78-79).

It was 1992 before *Systenus* was again reported in Yorkshire, when a male *S. pallipes* was (unusually) swept in Pot Ridings Wood (VC63) by Andrew R. Godfrey, 1 August 1992 (Godfrey, 1993, pp.15-16) as *S. pallidus* Vaillant, later synonymised with *S. pallipes*. During the 1990s Mr. Godfrey successfully reared members of the genus from a variety of sites in the County and all from rot-hole debris and 'sappy wood', mostly gathered from Horse Chestnut (*A. hippocastanum*) and all records are thanks to his skill and diligence. In 1994 two male *S. mallochi* MacGowan were bred from material gathered at Pot Ridings Wood; these remain the only Yorkshire records for this species. *Systenus bipartitus* (Lw.) was reported from Duncombe Park (VC62) and Hugsett Wood (VC63) - the latter from a Sycamore (*Acer pseudoplatanus* L.) rot-hole. *S. leucurus* was reported in the 1990's from Escrick Park (VC61) and Duncombe Park. Finally, *S. scholtzii* (Lw.) was reported by Mr Godfrey from rot-holes and 'sappy wood' from eight sites, chiefly in the 1990's, and with the addition of Castle Howard and Gilling Woods (both VC62) in 2003. The only *Systenus* recorded from VC61 is this species, from Western Cemetery, Hull in 1996. It has yet to be found in vice-counties 64 and 65.

My friend and mentor the late John H. Flint in later life ceased referring to 'rare' insect species. Instead, he said they were 'rarely found'. By the usual standards *Systenus* species are almost all 'rare' but, as these foregoing examples demonstrate, they can be found if sought in the right places and given the patience and perseverance required to undertake tedious rearing exercises!

Thrypticus

There are currently nine British *Thrypticus* species, six of which have been recorded in Yorkshire. According to Assis Fonseca (op.cit. p.48), they are 'Small to very small flies, mainly shining metallic green in colour. The life-history of the species differs from that of all other members of the family, the larvae being plant-miners and developing in the stems of Monocotyledons'.

Some species are notoriously difficult to name with certainty, at least without genitalia examination, and the genus appears to have been ignored by earlier Yorkshire dipterists.

The first *Thrypticus* to be recorded in the county was *T. tarsalis* Parent, taken by visiting dipterist J.H.Cole at Clapgate Gill (VC65) on 14 June 1974. There have been further records from Pudding Dike by the Chesterfield Canal (VC63) in 1988 and Seivedale Fen (VC62) in 2009. Most records

for the genus are post-1990 and colleagues attending the Dipterists Forum 1996 field week based at Escrick Park, York, added welcome records. The most frequently recorded is *T. bellus* Lw., the first being from a marsh at the head of Lindley Reservoir (VC64) in 1984, and it has now been recorded from sites in 15 hectads across the county. *T. divisus* (Strobl) is recorded only from Skipwith Common (VC61) in 1996. *T. laetus* Verr., first recorded at Blackburn Meadows (VC63) in 1991, has subsequently been recorded at a further eight sites in a total of seven hectads, ranging from Spurn in the east to Ellington Banks in the north-west. *T. nigricauda* Wood is known from only one site, the margins of a pond at High Batts (VC64), in 1999. Finally, *T. pollinosus* Verr. has been reported from three sites: Sand Dale (VC62) in 1990, Rawcliffe Meadows (VC62) in 2004, and Inkle Moor (VC63) in 2012.

It is known that there are additional British *Thrypticus* species awaiting publication, at least one of which has been recorded in Yorkshire, and also the genus is currently being revised (Andrew Godfrey and Martin Drake pers.comm.), so this present report is only provisional.

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Notable records of leaf-mining moths in East Yorkshire, 2019 and 2020

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In contrast to the familiar butterfly and macromoth caterpillars, a significant proportion of micromoth larvae feed *within* their favoured food plants and, in doing so, create distinctive and often diagnostic mines (Smart, 2017; Langmaid *et al*., 2018). As described previously, moths with leaf-mining larvae have historically been under-recorded in East Yorkshire (VC61) but the

situation is gradually being addressed (Nunn, 2015, 2017, 2019; Nunn & Warrington, 2016). This article documents my most notable leaf-mining moth records from 2019 and 2020 and attempts to predict which species are most likely to be added to the VC61 list in the future. The species codes in the systematic list follow Agassiz *et al*. (2013).

Eriocraniidae

2.005 *Eriocrania salopiella*. The first and second VC61 records occurred on 29 May 2020 and 2 June 2020, when I found tenanted mines in Silver Birch *Betula pendula* leaves in North Cliffe Wood. There are few Yorkshire records and the species is apparently scarce, but this is likely partly due to difficulties in separating both the adults and mines of the birch-feeding Eriocraniidae. *Eriocrania sparrmannella* is the most likely confusion species in the larval stage but that species generally mines later in the year (June-August) than *E. salopiella* (May-June).

Nepticulidae

4.006 *Stigmella sakhalinella*. The third VC61 record occurred on 11 September 2019 when I found a vacated mine in a Silver Birch leaf at Skipwith Common, and the fourth and fifth, respectively, occurred in Skidby on 20 October 2020 and at Eastrington Ponds on 3 November 2020. The first two records were from North Cliffe Wood in 2014 and Sledmere in 2018. The mines of *S. sakhalinella* are usually straightforward to distinguish from those of the other birch-feeding *Stigmella* species, so is unlikely to have been overlooked.

4.009 *Stigmella alnetella*. The third VC61 record occurred on 25 October 2019 when I found a tenanted mine in a Common Alder *Alnus glutinosa* leaf in Cottingham. The first two records were from Howsham in 2016 and North Cliffe Wood in 2018. The status of this species in Yorkshire is still unclear owing to confusion with *Stigmella glutinosae* in the past, but it is likely more common and widespread than records suggest. Only tenanted mines can be distinguished from those of *S. glutinosae* as it is necessary to see the larva to confirm the identification; *S. glutinosae* has a distinct prothoracic spot, whereas *S. alnetella* does not.

4.019 *Stigmella viscerella*. The first VC61 record occurred on 15 October 2020 when I found a vacated mine in an English Elm *Ulmus procera* leaf at North Cave Wetlands. Elms are not particularly common in VC61 and this is evidently the rarest of the elm-feeding *Stigmella* species, with the majority of Yorkshire records being from VC63. *Stigmella viscerella* produces a distinctive mine and is unlikely to have been overlooked, but the elm hedgerows at North Cave Wetlands suffer heavy feeding damage from *Coleophora serratella* (Coleophoridae) larvae, which increases the difficulty of locating the mines of other elm-feeding species.

4.022 *Stigmella regiella*. The third VC61 record occurred on 15 October 2020 when I found tenanted mines in Common Hawthorn *Crataegus monogyna* leaves at North Cave Wetlands. The first and second records were from Walkington in 2017 and Sledmere in 2018. Hawthorn is widespread and *S. regiella* produces a relatively distinctive mine, so appears to be scarce in VC61.

4.053 *Stigmella incognitella*. The first VC61 record occurred on 3 September 2019 when I found vacated mines in Crab Apple *Malus sylvestris* leaves at North Cave Wetlands. The second, third and fourth records occurred on 11 July, 15 and 25 October 2020 when I again found mines at North Cave Wetlands (twice) and in Skidby. This moth is uncommon in Yorkshire with the

majority of records being from VC63.

4.074 *Ectoedemia sericopeza*. The third and fourth VC61 records occurred on 19 July and 7 September 2019 when I found mines in Norway Maple *Acer platanoides* samaras in Hull. The first and second records were from Hull and Skidby in 2018. This micro is possibly limited by the distribution of the food plant but I have found mines even on single isolated trees. *Ectoedemia sericopeza* mines are inconspicuous and, in my experience, the easiest way to find them is to check fallen samaras following strong winds.

4.088 *Ectoedemia heringella*. The first VC61 record occurred on 8 September 2019 when I found vacated mines in Holm Oak *Quercus ilex* leaves in Hessle, and the second and third occurred on 13 March and 14 December 2020, respectively, when I found tenanted mines at the same site and in North Ferriby. This moth was first recorded in Yorkshire in 2019 in VC63. I have been monitoring Holm Oaks in approximately 15 locations, including some <10 km from Hessle and North Ferriby, since 2015, and it appears that *E. heringella* is a recent arrival in VC61; no mines were observed on the Hessle Holm Oaks in 2017.

4.091 *Ectoedemia heringi*. The first VC61 record occurred on 3 November 2020 when I found a tenanted mine in an oak leaf at Eastrington Ponds. There are relatively few Yorkshire records, probably at least partly due to difficulties in separating *E. heringi*, *E. albifasciella* and atypical *E. subbimaculella* mines, but I inspected oaks in various locations in 2018 and 2019 and it does appear that *E. heringi* is currently scarce in VC61. Only tenanted mines can be distinguished from those of *E. albifasciella* as it is necessary to see the larva to confirm the identification; *E. heringi* has a dark brown head, whereas *E. albifasciella* has a pale brown head.

4.096 *Ectoedemia arcuatella*. The first VC61 record occurred on 7 November 2020 when I found mines in Wild Strawberry *Fragaria vesca* leaves (Fig. 1, p132) at Low Hunsley. There are few Yorkshire records and this moth is apparently rare which, at least in VC61, is probably due partly to the limited distribution of the food plant. It is unlikely to be confused with any of the strawberry-feeding *Stigmella* species as the initial gallery is contorted and contains coiled frass.

4.097 *Ectoedemia rubivora*. The second VC61 record occurred on 8 October 2019 when Charles Fletcher and I found tenanted mines in bramble leaves near Wharram Le Street. The first record was from Thorpe Bassett in 2015. Brambles are widespread and *E. rubivora* is unlikely to be confused with any of the other bramble-feeding micros, so appears to be rare in VC61.

Heliozelidae

6.001 *Antispila metallella*. The first VC61 record occurred on 11 July 2020 when I found tenanted mines in Dogwood *Cornus sanguinea* leaves at North Cave Wetlands. Dogwood is not uncommon in Yorkshire and *A. petryi* (unrecorded in Yorkshire) is the only potential confusion species, so *A. metallella* appears to be genuinely scarce.

Gracillariidae

15.012 *Caloptilia semifascia*. The second VC61 record occurred on 27 August 2020 when I found a larval cone on a Field Maple *Acer campestre* leaf (Fig. 2, p132) in Little Weighton. The first record was at Tophill Low Nature Reserve in 2018. The literature is somewhat unclear, but *C. semifascia* larvae can also occasionally feed on Norway Maple, along with potential

confusion species, whereas larval cones on Field Maple are apparently diagnostic (Beaumont *et al*., 2020).

Figure 1 (top left) *Ectoedemia arcuatella* mine on Wild Strawberry.
Figure 2 (top right) *Caloptilia semifascia* larval cone on Field Maple.
Figure 3 *Euspilapteryx auroguttella* mine on St. John's-wort. Images: Andy D. Nunn.

15.016 *Euspilapteryx auroguttella*. The third VC61 record occurred on 17 October 2019 when I found tenanted mines in St. John's-wort *Hypericum* leaves (Fig. 3) at Humber Bridge Country Park. The first two records, of adults, were in Hessle and North Ferriby in 2015. St John's-worts are not uncommon in VC61 but *E. auroguttella* mines are inconspicuous and could easily be overlooked, even when specifically searching the plants for leaf mines (e.g. of *Fomoria* [*Ectoedemia*] *septembrella*).

15.019 *Acrocercops brongniardella*. The first VC61 record occurred on 14 December 2020 when I found two vacated mines in Holm Oak leaves in North Ferriby. Despite the larval food plants being widespread, this moth is uncommon in Yorkshire, with most records from VC63. There is a possibility, however, that it has been overlooked as it mines early in the year (May-June), before the traditional 'leaf-mining season', and could potentially be confused with *Tischeria ekebladella* (Tischeriidae) or *Profenusa pygmaea* (a hymenopteran).

15.037 *Phyllonorycter tenerella*. The second Yorkshire record was confirmed on 20 March 2020

when I reared adults from mines in Hornbeam *Carpinus betulus* leaves collected near Market Weighton on 11 November 2019. The first record was from the same location in 2016. On both occasions the mines were collected from small trees in a plant nursery's car park, but it is impossible to know whether or not the moth arrived in the county naturally.

15.057 *Phyllonorycter dubitella*. The first VC61 record was confirmed on 18 March 2020 when I reared adults from mines in Goat Willow *Salix caprea* leaves collected from Cottingham on 25 October 2019. There are relatively few Yorkshire records but this micro could be more common and widespread as the mines of the willow-feeding *Phyllonorycter* species are extremely difficult to distinguish; it is necessary to rear adults from putative *P. dubitella* mines to rule out the possibility of *P. hilarella*.

15.090 *Phyllocnistis saligna*. The first VC61 record occurred on 13 September 2019 when I found vacated mines in White Willow *Salix alba* leaves in Cottingham. This moth was first recorded in Yorkshire in VC63 in 2019. It is unclear whether *P. saligna* is a recent colonist or an overlooked, albeit rare, resident in the county.

Elachistidae

38.001 *Perittia obscurepunctella*. The second VC61 record occurred on 15 July 2020, when Ian Marshall and I found a tenanted mine in a honeysuckle leaf in North Cliffe Wood. The first record was at Skipwith Common in 1894. It is possible that *P. obscurepunctella* is scarce but overlooked in VC61, as honeysuckles are widespread but the larvae occur in the summer (June-August), so could be missed during searches for leaf mines in the autumn.

The majority of the common leaf-mining moths that were absent from the VC61 list have been added in recent years (see Nunn, 2015, 2017, 2019; Nunn & Warrington, 2016). Notwithstanding, there are still several that have been recorded in Yorkshire in VC62–VC65 but not VC61, including *Stigmella tiliae*, *S. magdalenae*, *S. myrtillella*, *Ectoedemia weaveri*, *Bucculatrix cidarella* (Bucculatricidae), *Phyllonorycter roboris* and *P. junoniella*. It is probable that *S. tiliae* occurs in VC61 but is restricted by the distribution of its preferred food plant, Small-leaved Lime *Tilia cordata*. I am yet to find Small-leaved Lime in VC61 but have searched other limes, which are occasionally used as food plants, in various locations and did record *S. tiliae* on a Large-leaved Lime *Tilia platyphyllos* in Lincolnshire (VC54), approximately 13km south of VC61. Most of the few Yorkshire records of *S. magdalenae* are a considerable distance to the west of VC61 but Rowan *Sorbus aucuparia*, the larval food plant, is widespread and it is likely that it exists somewhere in East Yorkshire. Similarly, Common Alder is widespread and it is likely that *B. cidarella* occurs in VC61; I have recorded it on four occasions during opportunistic searches in VC63 but more concerted efforts elsewhere have so far been unsuccessful. By contrast, it is unlikely that *S. myrtillella*, *E. weaveri* and *P. junoniella* are resident in VC61, due to the suspected extirpation and absence, respectively, of Bilberry *Vaccinium myrtillus* and Cowberry *Vaccinium vitis-idaea* (Middleton & Cook, 2015). Any VC61 records of these moths are therefore most likely to be of adults that have dispersed from elsewhere in the county. Oaks, conversely, are widespread in Yorkshire, but recent records of *P. roboris* are confined to VC63. It is possible, however, that it occurs in VC61, perhaps at Skipwith Common, Allerthorpe Common, North Cliffe Wood or Houghton Moor. There will be others that reside undetected in East Yorkshire, no doubt including numerous Coleophoridae, the adults of which can invariably only be identified to species level by dissection.

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Plant Galls: New Discoveries in 2020

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The summer of 2020 was remarkable for the discovery of some gall species in Yorkshire. In late August Annefie and Peter Roberts, Catherine Artindale and Mark Dudley, members of the Barnsley Naturalist and Scientific Society, were enjoying a walk on the old pit stack at Barnsley Main Colliery, South Yorkshire (SE364061). They discovered numerous galls on Dog Rose *Rosa canina* which at first appeared to be *Diplolepis rosae*. However, these galls were green with hints of red but the spines or hairs on the surface of the galls were short and unbranched, up to 3mm in length, very different from the longer-branched red hairs of *D. rosae*. On many of the short young Rose bushes a number of galls were tightly clustered together in an irregular mass. After checking the identification with Michael Chinery's 'Britain's Plant Galls' (2011) they thought their discovery may be *Diplolepis mayri* (Fig. 1, p136). In a concluding statement about this species, Chinery wrote that it has a "similar life cycle to *D. rosae* but is a much rarer insect and its galls are unlikely to be found other than in southern England."

Most confirmed identifications of *D. mayri* are from the south where they have been found on chalk downland in Kent, Surrey, the Isle of Wight and Oxfordshire. In 2014 Joan Egan, a Sorby member, found a gall which appeared to be *D. mayri* on rose on the tow path of the Sheffield and Tinsley Canal (SK375884). The causer of this gall was initially attributed to *D. mayri* (Frankum, 2016). However, later examination of reared adults showed the gall was actually induced by *D. rosae* (Bowdrey and Frankum, 2016). Bearing this in mind, photographs and specimens of the galls found in Barnsley were sent to Jerry Bowdrey. Jerry thought they indicated galls of *D. mayri* and he bred out the causer to confirm the identification.

D. mayri produces multilocular galls on the buds or undersides of leaves, which are green, brown and hard when mature; the wall bears many slender, unbranched spines of some 3mm length. Many of the Barnsley galls seemed to occur on smaller shrub roses. Approximately 50 specimen groups were counted in a distance of c.200m. Interestingly, *D. rosae* galls were found away from this colony. A study of old maps of Barnsley Main by Peter Roberts revealed that the footpath where galls had been found roughly corresponds with the route of an old pit rail/tramway, which may have been constructed using limestone ballast, thereby providing a calcareous substrate.

The front cover of Cecidology autumn 2020 featured a photograph of *Andricus infectorius* taken by Ian Farmer during a Doncaster Naturalists' Society gall meeting to King's Wood, Bawtry (SK652944) in September 2020. Ian had been fortunate in having photographed a similar gall in 2019 when he visited Charnwood Lodge Nature Reserve, Leicestershire, with Chris Leach. This led to Chris writing a paper for Cecidology referring to 'the Mysterious Oak Gall of Charnwood Lodge' (Leach, 2019). He shared photographs with BPGS members with the hope of reaching an identification of the gall. In a postscript to this paper Chris was delighted that Professor Graham Stone identified the causer as the asexual generation *Andricus infectorius*. He had received records of this gall from Cornwall and Devon. The gall initially looks like *A. kollari*. *Andricus infectorius*, like *A. kollari*, is found galling the terminal buds. When young, the galls are green with raised yellowish bumps. As they mature, they become reddish brown and, although the outer surface becomes crinkled and slightly pliable, the galls beneath are extremely hard and woody, typically 10mm across. The wasp emerges from the galls in spring and the formation of new galls begins in June/July with galls maturing by October. During late November to early January the galls fall to the ground where they overwinter (Leach, 2020).

Oak gall wasps often have two generations per cycle, with one sexual and one asexual: each creating different galls. Only the asexual generation is known for certain for *Andricus infectorius* but Stone thinks, along with other expert cecidologists, that the sexual generation, like other galls in the *A. kollari* group, may probably occur on *Quercus cerris*. Margaret Redfern (Redfern 2011) has listed gall wasps which are dependent on *Q. cerris* for their sexual generations. These include: *A. kollari*, *A. quercuscalicis, A. lignicolus, A. corruptrix, A. lucidus, A. aries, A. grosssulariae, A. gemmeus* and possibly *Andricus infectorius*. It is only *A. lucidus* and *Andricus infectorius* that are not yet common in Yorkshire.

Margaret Redfern has highlighted some of the problems of the identity of the Aleppo gall now known as *Andricus infectorius* (Fig.2, p136). The identity of the Aleppo gall has been confused throughout history, probably because of its use and importation all over Europe and further east in Asia for making medicines, dyes and inks and for tanning leather. Huge numbers of

Aleppo galls were being imported annually into Britain. *A. kollari* had been introduced into Britain from about 1832-1834 for its tannin content but this was only about 14% compared to the Aleppo gall's 65-75%.

Fig. 1 *Diplolepis mayri*
Photo: Tom Higginbottom

Fig. 2 *Andricus infectorius*
Photo: Ian Farmer

Fig. 3 *Mikiola fagi*
Photo: Duerden Cormack

The Beech gall midge *Mikiola fagi* (Fig. 3) was for many years uncommon in Britain, at times even regarded as being extinct. Generally records have been from the south although there have been occasional records for VC64 and VC65 in more recent years. *M. fagi* are smooth, larger than the more common *Hartigiola annulipes* galls, which are often hairy in their early stages. The galls are ovoid and pointed, they start green and often become reddish with age, growing to about 1cm tall and scattered about the upper surfaces of the leaves, mostly near the mid-ribs. They are unilocular and unilarval. The galls begin to grow in July but later in the year, September to October, is the best time to search for them. Galls containing male larvae are narrower and smaller than those containing female larvae. When the larvae are full grown the galls drop to the ground, often before the leaves fall, and the larvae close the openings with

silk. They hibernate in the gall and pupate in spring. Duerden Cormack discovered *M. fagi* on Woodhouse Ridge, Leeds (SE289360) in October 2020, his fine photograph is the first time I have seen an image of a Yorkshire record.

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Yorkshire Ichneumons: Part 13

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Introduction

Yorkshire statuses are taken from the chart shown on the YNU website: www.ynu.org.uk/insects/parasitic_wasps

† = new county record
*= new vice-county record

Subfamily **PIMPLINAE**

Additions to Ely (2013):

Dolichomitus mesocentrus (Gravenhorst, 1829). Rare in Yorkshire.
*VC62: Broxa Woods 21.8.2020 G.Featherstone.

Scambus elegans (Woldstedt, 1877). Rare in Yorkshire.
*VC62: Strensall Common 6.5.2016 R.Crossley.

Subfamily **TRYPHONINAE**

Additions to Ely (2015a):

Netelia (Bessobates) latungula (Thomson, 1888). Scarce in Yorkshire.
*VC61: Frog Hall, Allerthorpe Common 31.7.1932 W.J.Fordham (det. G.J.Kerrich)

Polyblastus (Polyblastus) tener Habermehl, 1909. Scarce in Yorkshire.
*VC62: Glaisdale Dale Wood 19.5.2020 G.Featherstone.

Ctenochira genalis Holmgren, 1855. Scarce in Yorkshire.
*VC61: Skerne Wetlands YWT NR 9.8.2014 R.Crossley.

Tryphon (Tryphon) thomsoni Roman, 1939. Scarce in Yorkshire.
Reported from VC62 in Walsh & Rimington (1956) p279.

Tryphon (Stenocrotaphon) obtusator (Thunberg, 1822). Rare in Yorkshire.
†VC64: Barden 22.5.1919 R.Butterfield.

Eridolius curtisii (Haliday, 1838). Rare in Yorkshire.
*VC63: Keighley 1919 R.Butterfield.
Eridolius pictus (Gravenhorst, 1829). Scarce in Yorkshire.
*VC61: The Mask SSSI, Newton-on-Derwent 1.8.2020 R.Crossley.

Subfamily **ADELOGNATHINAE**

Additions to Ely (2015b):
Adelognathus tetratinctorius (Thunberg, 1824). New to Yorkshire.
†VC61: Hacking Wood, Escrick Park 8-15.7.2003 S.E.M.Fraser.

Subfamily **PHYGADEUONTINAE**

Additions to Ely (2016):
Arotrephes perfusor (Gravenhorst, 1829). Rare in Yorkshire.
*VC62 Strensall MTA pond 20.5.2016 R.Crossley.
Gelis edentatus (Förster, 1850). Rare in Yorkshire.
*VC62 Whitby 22.5.1936 H.Britten.
Gelis hortensis (Christ, 1791). Scarce in Yorkshire.
*VC62: Upgang 26.11.1935 H.Britten jnr.
Gelis micrurus (Förster, 1850). Rare in Yorkshire.
*VC64: Eshton Tarn 19.7.1919 R.Butterfield.
Gnypetomorpha obscura (Bridgman, 1883). Rare in Yorkshire.
*VC64: Kirkstall Valley Farm 31.7-7.8.2020 A.Millard.
Zoophthorus infirmus (Gravenhorst, 1829). Rare in Yorkshire.
Reported from VC62 in Walsh & Rimington (1956) p110.
Endasys brevis (Gravenhorst, 1829). Rare in Yorkshire.
*VC62: Staintondale 28.6.1926 G.B.Walsh.
Endasys striatus (Kiss, 1924). Scarce in Yorkshire.
*VC61: Wilson's Plantation, Limefield Farm, Stamford Bridge 8-15.7.2003 S.E.M.Fraser.
Glyphicnemis clypealis (Thomson, 1883). Rare in Yorkshire.
*VC61: The Mask SSSI, Newton-on-Derwent 30.6.2020 R.Crossley.
Phygadeuon exiguus Gravenhorst, 1829. Rare in Yorkshire.
Reported from VC62 in Walsh & Rimington (1956) p112.
Phygadeuon fumator Gravenhorst, 1829. Rare in Yorkshire.
*VC63: Keighley 6.1918 R.Butterfield.
Phygadeuon ovatus Gravenhorst, 1829. Rare in Yorkshire.
Reported from VC62 in Walsh & Rimington (1956) p112.
Phygadeuon paradoxus (Bridgman, 1889). Rare in Yorkshire.
Reported from VC62 in Walsh & Rimington (1956) p112.
Phygadeuon variabilis Gravenhorst, 1829. Rare in Yorkshire.
Reported from VC62 in Walsh & Rimington (1956) p112.
*VC63: Bradford 1912 R.Butterfield.

Subfamily **CRYPTINAE**

Additions to Ely (2017):
Aptesis jejunator (Gravenhorst, 1807). Rare in Yorkshire.
Reported from VC62 in Walsh & Rimington (1956) p275.
*VC64: Barden 1908 R.Butterfield.
Cubocephalus brevicornis (Taschenberg, 1865). Rare in Yorkshire.
*VC64: Grassington 18.9.1918 R.Butterfield.

Cubocephalus sperator (Müller, 1776). Rare in Yorkshire.
*VC63: Keighley 1914 R.Butterfield.
Pleolophus brachypterus (Gravenhorst, 1815). Rare in Yorkshire.
†VC62: Beck Hole 3.8.1936 H.Britten jnr.
Gambrus incubitor (Linnaeus, 1758). Rare in Yorkshire.
†VC63: Keighley 10.1916 R.Butterfield.
Ischnus alternator (Gravenhorst, 1829). New to Yorkshire.
*VC61: disused chalk quarry, Millington Dale 6.2020 R.Crossley.
†VC63 Little Stones 27.4.2005 W.A.Ely.
Ateleute linearis Foerster, 1871. New to Yorkshire.
†VC61: Hacking Wood, Escrick Park 8-15.7.2003 S.E.M.Fraser.

Subfamily **BANCHINAE**

Additions to Ely (2018a):
Glypta (Glypta) incisa Gravenhorst, 1829. Rare in Yorkshire.
*VC64: Kirkstall Valley Farm 31.7-7.8.2020 A.Millard.
Lissonota (Loxonota) histrio (Fabricius, 1798). Rare in Yorkshire.
*VC62: Coatham dunes 29.7.2020 D.Whiteley.
Lissonota (Campocineta) nigridens Thomson, 1889. Rare in Yorkshire.
*VC61: Wilson's Plantation, Limefield Farm, Stamford Bridge 8-15.7.2003 S.E.M.Fraser.

Subfamily **CTENOPELMATINAE**

Additions to Ely (2019):
Lathrolestes luteolator (Gravenhorst, 1829). Rare in Yorkshire.
Reported from VC62 by Walsh & Rimington (1956) p276.
Trematopygus vellicans (Gravenhorst, 1829). New to Yorkshire.
†VC61: East Cottingwith Ings, Lower Derwent Valley NNR 10-19.5.2019 J.O.H.Small.
Alexeter niger (Gravenhorst, 1829). Rare in Yorkshire.
*VC64: Barden 16.8.1919 R.Butterfield.
Perispuda sulphurata (Gravenhorst, 1807). Rare in Yorkshire.
*VC62: Hole of Horcum 26.7.1937 H.Britten.
Scopesis bicolor (Gravenhorst, 1829). Rare in Yorkshire.
Reported from VC62 by Walsh & Rimington (1956) p276.
Mesoleius axillaris (Stephens, 1835). Scarce in Yorkshire.
*VC64: Kirkstall Valley Farm 31.7-7.8.2020 A.Millard.
Mesoleius nivalis Holmgren, 1857. Rare in Yorkshire.
*VC61: Wigman Wood, Wheldrake 4-11.9.2003 S.E.M.Fraser.
Mesoleius filicornis Holmgren, 1876. Rare in Yorkshire.
Reported from VC62 by Walsh & Rimington (1956) p276.

Subfamily **CAMPOPLEGINAE**

Additions and correction to Ely (2019):
Sinophorus albidus (Gmelin, 1790). Rare in Yorkshire.
†VC61: Primrose Valley 11.7.1924 G.B.Walsh.
Campoplex borealis (Zetterstedt, 1838). Rare in Yorkshire.
†VC62: Hole of Horcum 7.5.1930 H.Britten.
Campoplex faunus Gravenhorst, 1829. Rare in Yorkshire.
†VC63: Cowling 3.7.1918 R.Butterfield.

Nemeritis macrocentra (Gravenhorst, 1829). Rare in Yorkshire.
Reported from VC62 by Walsh & Rimington (1956) p278.
Bathyplectes exiguus (Gravenhorst, 1829). Rare in Yorkshire.
*VC61: The Mask SSSI, Newton-on-Derwent 30.6.2020 R.Crossley.
Nepiesta mandibularis (Holmgren, 1860). The VC62 record is an error.
Venturia canescens (Gravenhorst, 1829). Rare in Yorkshire.
Reported from VC62 by Walsh & Rimington (1956) p278.
Dusona blanda (Förster, 1868). Rare in Yorkshire.
*VC61: Wilson's Plantation, Limefield Farm, Stamford Bridge 8-15.7.2003 S.E.M.Fraser.
Dusona minor (Provancher, 1879). New to Yorkshire.
†VC61: East Cottingwith Ings, Lower Derwent Valley NNR 10.4.2021 J.O.H.Small.
Dusona notabilis (Förster, 1868). New to Yorkshire.
†VC61: Hollow Swang, Skipwith Common NNR 20-23.5.2018 J.O.H.Small.
Dusona remota (Förster, 1868). Rare in Yorkshire.
†VC62: Woodlands 18.5.1936 H.Britten.
Diadegma chrysotictos (Gmelin, 1790): Northallerton Rigg is in VC62, not VC65.
Olesicampe argentata (Gravenhorst, 1829). Rare in Yorkshire.
Reported from VC62 by Walsh & Rimington (1956) p279.
Hyposoter albonotatus (Bridgman, 1889). Rare in Yorkshire.
*VC64: Hollins Hill, Baildon (SE1740) 25-30.9.2018 H.N.Whiteley.

Subfamily **CREMASTINAE**

Additions to Ely (2020a):
Cremastus bellicosus Gravenhorst, 1829. Rare in Yorkshire.
†VC63: Wilsden 31.5.1908 R.Butterfield.
Cremastus infirmus Gravenhorst, 1829. Rare in Yorkshire.
*VC63: Wilsden 1915 R.Butterfield.
Pristomerus vulnerator (Panzer, 1799). Rare in Yorkshire.
*VC61: The Mask SSSI, Newton-on-Derwent 30.6.2020 R.Crossley.

Subfamily **TERSILOCHINAE**

Additions to Ely (2020a):
Tersilochus (Tersilochus) nitidipleuris Horstmann, 1971. New to Yorkshire.
†VC61: East Cottingwith Ings, Lower Derwent Valley NNR 10-19.5.2019 J.O.H.Small.

Subfamily **OPHIONINAE**

Additions to Ely (2020a):
Enicospilus inflexus (Ratzeburg, 1844). Scarce in Yorkshire.
*VC61: Rise Lane, Catwick 10.7.2019 J.Morgan.

Subfamily **MESOCHORINAE**

Additions to Ely (2020a):
Mesochorus orbitalis Holmgren, 1860. New to Yorkshire.
†VC61: orchid field, East Cottingwith Ings, Lower Derwent Valley NNR 19-25.5.2019 J.O.H.Small.

Subfamily **METOPIINAE**

Addition to Ely (2020a)
Trieces tricarinatus (Holmgren, 1858). Rare in Yorkshire.

*VC61: High Esk YWT NR 26.6.1988 W.A.Ely.

Subfamily **NEORHACODINAE**

Neorhacodes enslini (Ruschka, 1922). New to Yorkshire.

†VC61: Wigman Wood, Wheldrake 8-15.7.2003 S.E.M.Fraser.

Subfamily **ORTHOCENTRINAE**

Additions to Ely (2020b):

Picrostigeus debilis (Gravenhorst, 1829) . Rare in Yorkshire.

*VC64: Kirkstall Valley Farm 31.7-7.8.2020 A.Millard.

Subfamily **ORTHOPELMATINAE**

Orthopelma brevicorne Morley, 1907. Rare in Yorkshire.

Reported from VC63 by Barnes (1939).

*VC61: Allerthorpe Common 30.6.1984 W.A.Ely.

*VC65: Pepper Arden 1.7.2013 W.A.Ely.

Orthopelma mediator (Thunberg, 1822). Uncommon in Yorkshire.

Reported from VC62 in Walsh & Rimington (1956) p278 and from VC63 in Barnes (1939).

*VC61: Allerthorpe 24.6.1923 W.J.Fordham.

*VC64: Hetchell Wood YWT NR ex *D. rosae* 20.4 em 5.1980 W.A.Ely.

*VC65: High Batts NR 26.6.2003 J.Jobe.

The YNU records of Orthopelmatinae have been compiled as follows:

Decade	Species	Records	Records/Species	Collectors
1920-1929	1	1	1.0	1
1930-1939	2	7	3.5	2
1950-1959	1	1	1.0	1
1970-1979	1	3	3.0	2
1980-1989	2	7	3.5	3
1990-1999	1	1	1.0	1
2000-2009	1	3	3.0	2
2010-2019	2	5	2.5	5

Subfamily **COLLYRIINAE**

Collyria coxator (Villers, 1789). Scarce in Yorkshire.

Reported from VC61 in Hincks (1953b) p136 and Ely (2001) p186, from VC62 in Hincks (1951a) p28 and Fitton (1984) p186, from VC63 in Ely (2001) p186 and (2014f) p39 and from VC64 in Ely (2001) p186.

Collyria trichophthalma (Thomson, 1877). Frequent in Yorkshire.

Reported from VC61 and VC62 in Ely (2001) p186, from VC63 in Frost & Beadsmore (1985) p15 and Ely (1986h) p107, (1986k) p34 and (2001) p186 and from VC64 in Ely (2001) p186.

The YNU records of Collyrinae have been compiled as follows:

Decade	Species	Records	Records/Species	Collectors
1930-1939	1	5	5.0	3
1940-1949	2	7	3.5	3
1950-1959	1	4	4.0	1

1960-1969	1	2	2.0	1
1970-1979	1	1	1.0	1
1980-1989	1	19	19.0	6
1990-1999	1	9	9.0	6
2000-2009	1	9	9.0	2
2010-2019	1	17	17.0	3
2020-2029	1	1	1.0	1

Subfamily **DIPLAZONTINAE**

Fossatyloides gracilentus (Holmgren, 1858). Rare in Yorkshire.
Reported from VC63 in Hincks (1953a) p37.

*VC62: Terrace Bank Wood, Duncombe Park 18-29.7.2019 J.O.H.Small.
*VC64: Malham Tarn 13.8.1955 W.D.Hincks.

Homotropus collinus (Stelfox, 1941). Rare in Yorkshire.

†VC63: Holmeshouse Wood 16.9.1930 + 6.8.1939 + 29.9.1940 J.Wood.
*VC65: Ellington Firth 25.6.1964 [E.Broadhead may have been the collector] tS.Klopfstein.

Homotropus crassicrus (Thomson, 1890). Scarce in Yorkshire.
Reported from VC61 and VC64 in Mayhew *et al.* (2009) p11.

*VC63: Holmehouse Wood 14.10.1939 + 15.9.1940 J.Wood (det. H.Britten).
*VC65: Witton Fell 24 + 29.6.1965 [E.Broadhead] (det. S.Klopfstein).

Homotropus dimidiatus (Schrank, 1802). Scarce in Yorkshire.
Unconfirmed report from VC64 in Wilson (1883) p109 and Roebuck (1907) p215. Reported from VC62 in Walsh & Rimington (1956) p278.

*VC61: Skipwith Common YWT NR 11.9.1952 W.D.Hincks.
*VC63: Keighley 4.7.1918 R.Butterfield.

Homotropus elegans (Gravenhorst, 1829). Scarce in Yorkshire.
Unconfirmed report from VC62 in Morley (1911) p110. Reported from VC63 in Hincks (1953a) p37.

*VC61: Cali Heath YWT NR 17.5.2011 + 1.6.2014 R.Crossley.
*VC62: Hole of Horcum 7.5.1938 unknown (det. H.Britten).
*VC64: Blubberhouses Moor & Quarry 21.8.2011 A.R.Godfrey.

Homotropus frontorius (Thunberg, 1824). Common in Yorkshire.
Reported from VC63 in Hincks (1953a) p37, Skidmore *et al.* (1987) p127 and Skidmore (2006) p148.

*VC61: Allerthorpe 22.6.1952 J.H.Elliott.
*VC62: Buttercrambe Woods 10.5.1944 J.H.Elliott.
*VC64: Sunnydale 25.9.1926 J.Wood.
*VC65: Witton Fell 11.6.1963 [E.Broadhead]

Homotropus haemorrhoidalis (Szépligeti, 1898). Rare in Yorkshire.
Reported from VC63 in Hincks (1953a) p37.

Homotropus longiventris (Thomson, 1877). Frequent in Yorkshire.
Reported from VC61 and VC64 in Mayhew *et al.* (2009) p11 and from VC63 in Hincks (1953a) p37.

*VC62: Malton Road, York 13 + 14.5.1944 J.H.Elliott.

Homotropus megaspis (Thomson, 1890). Rare in Yorkshire.
Reported from VC63 and VC64 in Hincks (1953a) p37.

Homotropus nigritarsus (Gravenhorst, 1829). Common in Yorkshire.
Reported from VC61 in Mayhew *et al.* (2009) p11, from VC62 in Walsh & Rimington (1956) p278 (as *pictus*), from VC63 in Hincks (1951a) p28, Coldwell (1999) p61 and Denton (2017) p445 and from VC64 in Mayhew *et al.* (2009) p11.

*VC65: Witton Fell 24.6.1963 + 8.6.1964 [E.Broadhead].

Homotropus pallipes (Gravenhorst, 1829). Frequent in Yorkshire.

Reported from VC61 in Mayhew *et al.* (2009) p11, from VC63 in Hincks (1953a) p37 and from VC64 in Mayhew *et al.* (2009) p11 and Ely (2012b) p227

*VC62: Ephin Bridge Lane, Carlton Husthwaite 2.9.2011 W.A.Ely.

*VC65: Marsett Bridge, Bardale 19.7.1986 W.A.Ely.

Homotropus pectoralis (Provancher, 1874). Rare in Yorkshire.

†VC64: Malham Tarn 25 + 26.7.1956 W.D.Hincks.

Homotropus pictus (Gravenhorst, 1829). Common in Yorkshire.

Unconfirmed report from VC62 in Walsh & Rimington (1956) p278 and from VC63 in Ely (2014f) p39. Reported from VC61 and VC64 in Mayhew *et al.* (2009) p12,

*VC62: Great Lake, Castle Howard, N & NW shores 9.7.1988 W.A.Ely.

*VC63: Berry Lane, Keighley 6.7.1926 J.Wood.

*VC65: Witton Fell 17.6 + 17.10.1963 [E.Broadhead] (tS.Klopfstein).

Homotropus signatus (Gravenhorst, 1829). Common in Yorkshire.

Unconfirmed report from VC62 in Walsh & Rimington (1956) p278. Reported from VC61 in Fordham (1926) p118 and Mayhew *et al.* (2009) p12, from VC63 in Skidmore *et al.* (1987) p127, Skidmore (2006) p148 and Coldwell (1999) p62 and from VC64 in Morley (1918) p398 and Mayhew *et al.* (2009) p12.

*VC62: River Foss 11.6.1944 J.H.Elliott.

Homotropus sundevalli (Holmgren, 1856). Rare in Yorkshire.

Reported from VC63 in Hincks (1953a) p38, Ely (1986l) p35 and Denton (2017) p445.

*VC62: Ruston Cliff Wood, Forge Valley 6.9.1986 D.A.Shepherd.

*VC64: Dewbottom Scar, Grass Wood YWT NR 3.9.1988 W.A.Ely.

Syrphoctonus desvignesii (Marshall, 1870). Uncommon in Yorkshire.

Reported from VC61 in Hincks (1953b) p136, from VC62 in Walsh & Rimington (1956) p278 (as *signatus*) and from VC63 in Hincks (1953a) p37 and Key (1986b) p288.

*VC65: Colsterdale 1.6.1979 W.A.Ely.

Syrphoctonus fissorius (Gravenhorst, 1829). Uncommon in Yorkshire.

Reported from VC63 in Hincks (1953a) p37, Skidmore *et al.* (1987) p127 and Skidmore (2006) p148.

†VC61: Frog Hall, Allerthorpe Common 8.7.1928 W.J.Fordham.

*VC62: Malton Road, York 7.7.1945 + 15.6.1952 J.H.Elliott.

*VC64: Askham Bog YWT NR 15.6.1946 W.D.Hincks.

*VC65: Birk Gill , Colsterdale 31.8.1980 W.A.Ely.

Syrphoctonus tarsatorius (Panzer, 1809). Very common in Yorkshire.

Unconfirmed report from VC65 in Roebuck (1907) p215. Reported from VC61 in Hincks (1953b) p136 and Mayhew *et al.* (2009) p12, from VC62 in Walsh & Rimington (1956) p287 (also as *signatus* and as *Phytodietus (Phytodietus) ornatus),* from VC63 in Coldwell (1999) p61 and Denton (2017) p445 and from VC64 *in* Mayhew *et al.* (2009) p12 and Ely (2012b) p227.

* VC65: Witton Fell 8.6.1964 [E.Broadhead].

Enizemum nigricorne (Thomson, 1890). Rare in Yorkshire.

†VC63: Holmehouse Wood 30.9.1939 J.Wood.

Enizemum ornatum (Gravenhorst, 1829). Common in Yorkshire.

Unconfirmed report from VC62 in Morley (1911) p113. Reported from VC61 in Fordham (1926) p118, Hincks (1953b) p136 and Mayhew *et al.* (2009) p10, from VC63 in Hincks (1944a) p38 and Denton (2017) p445 and from VC64 in Hincks (1944a) p38 and Mayhew *et al.* (2009) p12.

*VC62: Clifton Ings 18.7.1942 W.D.Hincks.

*VC65: Birk Gill 2.9.1984 W.A.Ely.

Enizemum tridentatum Dasch, 1964. Rare in Yorkshire.

†VC64: Grass Wood YWT NR 3.9.1988 W.A.Ely (det. S.Klopfstein).

Woldstedtius biguttatus (Gravenhorst, 1829). Uncommon in Yorkshire.

Unconfirmed report from VC61 in Fordham (1919) p70. Reported from VC62 in Hincks (1956b) p149 and (1957) p21 and Key (1987a) p152 and from VC63 in Skidmore *et al.* (1987) p127, Skidmore (2006) p148, Coldwell (1999) p62 and Brown & Smith (2016) p13.

*VC61: West End Farm, Muston 28.9.2011 + 23.5.2012 W.A.Ely.

*VC64: Hell Wath, Ripon, hollow close to River Skell 2.6.1990 W.A.Ely.

*VC65: Hag Wood NT, Richmond 20.6.2014 W.A.Ely.

Woldstedtius citropectoralis (Schmiedeknecht, 1926). Uncommon in Yorkshire.

Reported from VC61 and VC64 in Mayhew *et al.* (2009) p12 and from VC63 in Hincks (1953a) p37.

*VC62: Mulgrave Woods 10.6.1935 H.Britten.

*VC65: Ellington Firth 7.9.1964 + 29.5.1965 [E.Broadhead].

Woldstedtius flavolineatus (Gravenhorst, 1829). Uncommon in Yorkshire.

Reported from VC61 in Hincks (1953b) p136 and Mayhew *et al.* (2009) p12, from VC63 in Hincks (1953a) p37, Skidmore *et al*. (1987) p127, Skidmore (2006) p148 and Denton (2017) p445 and from VC64 in Hincks (1953a) p37 and Mayhew *et al.* (2009) p12.

*VC62: Castlebeck Wood Woodland Trust NR, Harwood Dale 7.9.1986 W.A.Ely.

*VC65: Witton Fell 8.6.1964 [E.Broadhead].

Woldstedtius holarcticus Diller, 1969. Rare in Yorkshire.

†VC65: Ellington Firth 28.9 + 16.10.1964 [E.Broadhead] (det. S.Klopfstein)

Campocraspedon annulitarsis (Hedwig, 1838). Rare in Yorkshire.

†VC61: Humbleton 18.6.2011 W.A.Ely.

Campocraspedon caudatus (Thomson, 1890). Rare in Yorkshire.

Reported from VC62 in Hincks (1945d) p141 and Walsh & Rimington (1956) p278.

*VC63: Ewden valley 12.6.1991 A.Brackenbury.

*VC64: Near Wood, Askham Bog YWT NR 24.5 + 23.6.2015 R.Crossley.

Phthorima compressa (Desvignes, 1856). Rare in Yorkshire.

*VC61: Rush Wood, Naburn 3-10.6.2003 S.E.M.Fraser.

*VC62: Seamer Carr 28.8.1977 C.A.Howes (det. M.G.Fitton)

†VC63: Keighley Tip 7.9.1939 J.Wood.

*VC65: Nosterfield NR 19.7.2018 A.R.Godfrey.

Xestopelta gracillima (Schmiedeknecht, 1926). Rare in Yorkshire.

†VC61: North Cave Wetlands YWT NR 9.5 + 8.6.2016 R.Crossley.

Syrphophilus bizonarius (Gravenhorst, 1829). Frequent in Yorkshire.

Reported from VC63 in Ely (1984a) p8 and (1984c) p14 and Coldwell (1999) p62.

*VC61: Allerthorpe Common 23.6.1951 J.H.Elliott.

*VC62: Fen Bog YWT NR 14.8.2012 R.Crossley.

*VC64: disused railway embankment at Mill Hill from Seg Lane to New Lane, Drax Hales 27.7.1987 W.A.Ely.

Syrphophilus tricinctorius (Thunberg, 1822). Very common in Yorkshire.

Reported from VC61 in Fordham (1920a) p182 and Mayhew *et al.* (2009) p12, from VC63 in Hincks (1944a) p38 and Denton (2017) p445 and from VC64 in Hincks (1953a) p37 and Mayhew *et al.* (2009) p12.

*VC62: Malton Road, York 7.5.1944 J.H.Elliott.

*VC65: Semerwater 15.10.1947 W.D.Hincks.

Tymmophorus erythrozonus (Förster, 1850). Common in Yorkshire.

Reported from VC61 Hincks (1953b) p136, from VC62 in Hincks (1951a) p28 and from VC63 in Hincks (1953a) p37, Skidmore *et al.* (1987) p127, Skidmore (2006) p148 and Coldwell (1999) p61.

*VC64: Shipley Glen 6.1918 G.H.Rhodes.
*VC65: Hardings 2.7.1983 W.A.Ely.

Tymmophorus obscuripes (Holmgren, 1856) Very common in Yorkshire.
Reported from VC61 in Mayhew *at al.* (2009) p12, from VC62 in Fordham (1926) p118 and Walsh & Rimington (1956) p278, from VC63 in Hincks (1953a) p37 and Coldwell (1999) p61 and from VC64 in Mayhew *at al.* (2009) p12.
*VC65: Leighton Reservoir 3.7.1979.W.A.Ely

Diplazon albotibialis Dasch, 1964. Rare in Yorkshire.
†VC64: Dallowgill, Kirby Malzeard 7.7.1979 W.A.Ely.

Diplazon annulatus (Gravenhorst, 1829). Uncommon in Yorkshire.
Reported from VC61 in Hincks (1943d) p123 and (1944a) p37 and (1953a) p37, from VC62 in Walsh & Rimington (1956) p278, Hincks (1956b) p149 and (1957) p21 and Key (1987a) p152, from VC63 in Hincks (1953a) p37 and Ely (1986h) p107 and from VC65 in Newbould *et al.* (2013) p57.
*VC64: Malham Tarn NT 21 + 23 + 27.7.1956 + 31.7.1958 W.D.Hincks.

Diplazon deletus (Thomson, 1890). Rare in Yorkshire.
Unconfirmed report from VC62 in Walsh & Rimington (1956) p277. Reported from VC62 in Hincks (1956b) p149 and Key (1987a) p152.
*VC63: Hebden Bridge 31.8.1967 unknown.

Diplazon laetatorius (Fabricius, 1781). Very common in Yorkshire.
Unconfirmed report from VC62 in Roebuck (1877) p39, Bairstow (1878) p69 and Roebuck (1907) p215. Reported from VC61 in Hincks (1946b) p150 and (1953b) p136 and Mayhew *et al.* (2009) p9, from VC63 in Hincks & Dibb (1940) p176, Skidmore *et al.* (1987) p127, Coldwell (1999) p61, Skidmore (2006) p148 and Denton (2017) p445, from VC64 in Hincks (1944a) p38 and Mayhew *et al.* (2009) p9 and from VC65 in Ely (2011g) p222.
VC62:* Robin Hood's Bay 5.8.1927 G.B.Walsh..

Diplazon pectoratorius (Thunberg, 1822). Very common in Yorkshire.
Reported from VC61 in Fordham (1919) p70 and Mayhew *et al.* (2009) p9, from VC62 in Walsh & Rimington (1956) p278, from VC63 in Hincks (1944a) p38, Anon (1980) p7, Ely (1981b) p122, Coldwell (1999) p61 and Denton (2017) p445 and from VC64 in Hincks & Dibb (1940) p176 , Hincks (1944a) p38 and Mayhew *et al.* (2009) p9.
*VC65: Witton Fell 8.6.1964 [E.Broadhead].

Diplazon scutatorius Teunissen, 1943. Rare in Yorkshire.
Reported from VC64 in Mayhew *et al.* (2009) p9.
*VC63: Cusworth Park 5.8.1975 P.Skidmore (tM.G.Fitton).

Diplazon tetragonus (Thunberg, 1822). Very common in Yorkshire.
Unconfirmed report from VC65 in Morley (1911) p84. Reported from VC61 in Hincks (1953b) p136 and Mayhew *et al.* (2009) p9, from VC62 in Walsh & Rimington (1956) p278, from VC63 in Hincks & Dibb (1940) p176, Skidmore *et al.* (1987) p127, Coldwell (1999) p61, Skidmore (2006) p148 and Denton (2017) p446 and from VC64 in Hincks & Dibb (1940) p176, Hincks (1942) p172 and (1943b) p59 and Mayhew *et al.* (2009) p9.
*VC65 Witton Fell host pupa emerged 17.10.1963 [E.Broadhead].

Diplazon tibiatorius (Thunberg, 1822). Uncommon in Yorkshire.
Reported from VC61 in Hincks (1953b) p136, from VC62 in Walsh & Rimington (1956) p278 and from VC63 in Hincks & Dibb (1940) p38 and Hincks (1953a) p37.
*VC64: Oakwood, Leeds 27.5.1939 W.D.Hincks.
*VC65: Romaldkirk 2.7.1983 W.A.Ely.

Diplazon varicoxa (Thomson, 1890). Rare in Yorkshire.
Reported from VC63 in Hincks (1953a) p37 and from VC65 in Ely (2014d) p233.
*VC61: Frog Hall, Allerthorpe Common 5.9.1928 W.J.Fordham.

*VC62: Fyling Hall 6.1928 W.J.Fordham.

Promethes bridgmani Fitton, 1976. Uncommon in Yorkshire.

Reported from VC63 in Hincks (1953a) p37 and Anon (1986a) p17 and from VC64 in Mayhew *et al.* (2009) p9.

*VC62: Deepdale Wood, Loftus 15.9.2012 W.A.Ely.

*VC65: River Rawthey, Sedburgh 29.9.2012 W.A.Ely.

Promethes sulcator (Gravenhorst, 1829). Very common in Yorkshire.

Reported from VC61 in Hincks (1953b) p136 and Mayhew *et al.* (2009) p10, from VC63 in Coldwell (1999) p61 and Ely (2012d) p236 and from VC64 in Mayhew *et al.* (2009) p10.

*VC62: Malton Road, York 9.1944 J.H.Elliott.

*VC65: Jervaulx 16.10.1947 W.D.Hincks.

Sussaba cognata (Holmgren, 1856). Very common in Yorkshire.

Unconfirmed report from VC62 in Fordham (1931b) p356 and Walsh & Rimington (1956) p278. Reported from VC61 in Mayhew *et al.* (2009) p10, from VC63 in Hincks (1953a) p37 and from VC64 in Hincks (1945b) p110 and (1946a) p38 and Mayhew *et al.* (2009) p10.

VC65: Mill Beck Wood, Middleton-in-Teesdale 21.6.1981 W.A.Ely (tM.Boston).

Sussaba dorsalis (Holmgren, 1856). Uncommon in Yorkshire.

Unconfirmed report from VC62 in Morley (1911) p122. Reported from VC63 in Hincks (1953a) p37.

VC61: Well Springs, Stockingdale 25.6.1983 W.A.Ely (det. M.Boston)

*VC62: Fen Bog YWT NR 15.8.2011 + 3.8.2013 R.Crossley.

*VC64: Askham Bog YWT NR 20.8.1950 J.H.Elliott.

*VC65: Druid's Plantation 2.7.1977 W.A.Ely (det. M.Boston)]

Sussaba erigator (Fabricius, 1793). Rare in Yorkshire.

Unconfirmed report from VC64 in Bairstow (1878) p69, Roebuck (1907) p215 and Morley (1911) p123.

*VC63: Austerfield sand pit 23.7.2016 D.Whiteley (W.A.Ely).

*VC64 disused rly embankment at Drax Hales from Wadehouse Lane to Brickhill Lane 26.7.1987 W.A.Ely.

Sussaba flavipes (Lucas, 1849). Very common in Yorkshire.

Reported from VC61 in Mayhew *et al.* (2009) p10, from VC62 in Walsh & Rimington (1956) p278, from VC63 in Hincks (1953a) p37, Shaw & Ely (1986) p14 and Denton (2017) p446 and from VC64 in Hincks (1953a) p37 and Mayhew *et al.* (2009) p10.

*VC65: Masham 11.10.1947 W.D.Hincks.

Sussaba placita Dasch, 1964. Rare in Yorkshire.

Reported from VC61 and VC64 in Mayhew *et al.* (2009) p10,

*VC63: W remnant of Dewidales Wood, Woodsetts 18.9.2006 W.A.Ely.

Sussaba pulchella (Holmgren, 1856). Common in Yorkshire.

Reported from VC61 in Mayhew *et al.* (2009) p10, from VC63 in Hincks (1953a) p37, Key (1986b) p288 and Ely (1986h) p107 and from VC64 in Hincks (1942) p72 and (1943b) p59 and Mayhew *et al.* (2009) p11.

*VC62: Malton Road, York 14.5.1944 J.H.Elliott.

*VC65: Colsterdale 5.6.1982 W.A.Ely.

The YNU records of Diplazontinae have been compiled as follows:

Decade	Species	Records	Records/Species	Collectors
1860-1869	8	10	1.25	2
1870-1879	2	3	1.5	2

1880-1889	2	3	1.5	1
1890-1899	3	4	1.7	3
1900-1909	2	2	1.0	1
1910-1919	11	30	2.7	4
1920-1929	26	112	4.3	5
1930-1939	39	245	6.3	3
1940-1949	36	198	5.5	4
1950-1959	25	99	4.0	3
1960-1969	15	38	2.5	4
1970-1979	27	152	5.6	15
1980-1989	38	902	34.7	23
1990-1999	26	137	5.3	6
2000-2009	33	634	19.2	6
2010-2019	38	1232	32.4	30
2020-2029	12	29	2.4	4

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Yorkshire Heteroptera (True Bugs) – Part 1 Dipsocoromorpha, Nepomorpha, Gerromorpha & Leptopodomorpha (Waterbugs and Shorebugs)

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Introduction

The first list of Yorkshire Heteroptera was produced by W.J. Fordham and its two parts were published in *The Naturalist* in 1921. Many of the records accepted by Fordham were verified by E.A. Butler although records attributed to J. Young from 'Near Hull' remain unverified. Approximately 200 species were listed at the time; however it should be noted that subsequent taxonomic development has resulted in name changes, with some species being removed from the British list. Later records have been published by various authors in *The Naturalist* and it is recognised that private records may exist which are inaccessible to the author. In this centenary year the list of Yorkshire Heteroptera has been revised to include verified records from as many sources as is practicable. The revised list includes 429 recorded species, some of which are not native or are not known to breed in Britain.

The following list is the first of six parts which represent Yorkshire Heteroptera recorded to date

together with associated Vice Counties, statuses, hosts/habitats and years for the first and latest records. Some species can only be identified by dissection of male specimens. Consequently where the female cannot be reliably identified, or where specimens are unavailable for examination, such records are indicative only and may not have been validated. Several historic records fall into this group. In some instances the inhospitable or inaccessible habitats, and or diminutive size of adult bugs, make it difficult or dangerous to record the rarer species.

The status convention is based on: 1 to 9 records = Rare; 10 to 24 = Scarce; 25 to 49 = Uncommon; 50 to 99 = Frequent; 100 to 199 = Common; 200 or more = Very Common.
The taxonomy of European true bugs is relatively well documented for many countries. The references listed in the Bibliography have been used in compiling this paper and would assist in the identification of specimens.

The Dipsocoromorpha, Nepomorpha, Gerromorpha & Leptopodomorpha are Infraorders within the suborder Heteroptera of the Hemiptera. In Britain there are 88 recorded species representing 15 families of the Heteroptera; at present 74 of these are recorded from Yorkshire. Overall the number of records held by the YNU is insufficient to truly represent current distribution and status.

Infraorder: Dipsocoromorpha

Family: CERATOCOMBIDAE Fieber, 1860
Subfamily: CERATOCOMBINAE Fieber, 1860
Tribe: CERATOCOMBINI Fieber, 1860
Ceratocombus coleoptratus (Zetterstedt, 1819)
VC61, VC62, VC63, VC64: scarce, moss and dead leaves in damp places, 1966-2013.
Family: DIPSOCORIDAE
Cryptostemma alienum Herrich-Schaeffer, 1835
VC62, VC64, VC65: scarce, gravel and stones on silt at margins of fast streams, 1930-1987.

Infraorder: Nepomorpha
Superfamily: Nepoidea

Family: NEPIDAE Latreille, 1802
Subfamily: NEPINAE Latreille, 1802
Tribe: NEPINI Latreille, 1802
Nepa cinerea Linnaeus, 1758
VC61, VC62, VC63, VC64, VC65: common, ambush predator in weedy ponds, dykes and streams, 1935-2020.

Subfamily: RANATRINAE Douglas & Scott, 1865
Tribe:RANATRINI Douglas & Scott, 1865
Ranatra (Ranatra) linearis (Linnaeus, 1758)
VC62, VC62, VC63, VC64: scarce, ambush predator in erect submerged vegetation, 2000-2020.

Superfamily: Corixoidea

Family: CORIXIDAE Leach, 1815
Subfamily: MICRONECTINAE Jaczewski, 1924
Micronecta (Dichaetonecta) scholtzi (Fieber, 1860)

VC61, VC62, VC63: rare, feeding on algal detritus in weed-free shallows of lakes and ponds, 1950-2012.

Micronecta minutissima (Linnaeus, 1758)

VC62, VC65: rare, 1921-1934

Micronecta poweri poweri (Douglas & Scott, 1869)

VC62, VC63, VC64, VC65: scarce, clean and exposed lakes and river shallows, 1937-2018.

Subfamily: CYMATIAINAE Walton, 1940

Cymatia bansdorffi (C.R. Sahlberg, 1819)

VC61, VC63, VC64: scarce, ponds and lakes with submerged weed, 1953-2012.

Cymatia coleoptrata (Fabricius, 1777)

VC61, VC63, VC64: scarce, ponds and ditches with thick masses of weed and clear water, 1950-2020.

Subfamily: CORIXINAE Leach, 1815

Tribe: GLAENOCORISINI Hungerford, 1948

Glaenocorisa propinqua cavifrons (Thomson, 1869)

VC62, VC63, VC65: scarce, deep upland pools and reservoirs, 1942-2012.

Tribe: CORIXINI Leach, 1815

Arctocorisa carinata carinata (C.R. Sahlsberg, 1819)

VC61, VC63, VC64, VC65: rare, upland tarns and reservoirs, 1937-2004.

Arctocorisa germari (Fieber, 1848)

VC62, VC63, VC65: scarce, upland tarns and reervoirs,1943-2012.

Callicorixa praeusta praeusta (Fieber, 1848)

VC61, VC62, VC63, VC64, VC65: common, swamps and stagnant water, 1929-2020.

Callicorixa wollastoni (Douglas & Scott, 1865)

VC62, VC63, VC64, VC65: uncommon, mainly peat pools, 1942-2016.

Corixa affinis Leach, 1817

VC61, VC64: rare, ponds near the coast, 1929-2007.

Corixa dentipes Thomson, 1869

VC61, VC62, VC63, VC64: rare, reedy ponds and dykes, 1917-2012.

Corixa panzeri Fieber, 1848

VC61, VC62, VC63, VC64, VC65: uncommon, alkaline ponds, dykes and small lakes, 1947-2020.

Corixa punctata (Illiger, 1807)

VC61, VC62, VC63, VC64, VC65: common, weedy ponds and dykes, 1938-2020.

Hesperocorixa castanea (Thomson, 1869)

VC61, VC62, VC63, VC64, VC65: uncommon, thick vegetation in acidic water 1942-2017.

Hesperocorixa linnaei (Fieber, 1848)

VC61, VC62, VC63, VC64, VC65: frequent, lakes, reed beds and ponds, 1935-2020.

Hesperocorixa moesta (Fieber, 1848)

VC61, VC62, VC63: scarce, well vegetated ponds, 1930-2001.

Hesperocorixa sahlbergi (Fieber, 1848)

VC61, VC62, VC63, VC64, VC65: common, small bodies of water with dead vegetation, 1938-2020.

Paracorixa concinna concinna (Fieber, 1848)

VC61, VC62, VC63, VC64, VC65: uncommon, lakes and rivers with sandy bottoms, 1943-2020.

Sigara (Halicorixa) selecta (Fieber, 1848)
VC61: rare, brackish water, 1948-2007.
Sigara (Halicorixa) stagnlis stagnalis (Leach, 1817)
VC61, VC62, VC64: scarce, brackish water, 1947-2009.
Sigara (Pseudovermicorixa) nigrolineata nigrolineata (Fieber, 1848)
VC61, VC62, VC63, VC64, VC65: common, ponds and pools, 1929-2020.
Sigara (Retrocorixa) limitata limitata (Fieber, 1848)
VC61, VC62, VC63, VC64: scarce, vegetated ponds, 1936-2016.
Sigara (Retrocorixa) semistriata (Fieber, 1848)
VC61, VC62, VC63, VC64: uncommon, small shallow water on peat, 1947-2020.
Sigara (Retrocorixa) venusta (Douglas & Scott, 1868)
VC61, VC62, VC63, VC64, VC65: uncommon, small streams and ditches on moorland heaths, 1930-1986.
Sigara dorsalis (Leach, 1817)
VC61, VC62, VC63, VC64, VC65: common, lakes and rivers with sandy bottoms, 1929-2020.
Sigara striata (Linnaeus, 1758)
VC61, VC63, VC64: rare, rivers, clean canals, dykes and lake margins, 1949-1950.
Sigara (Subsigara) distincta (Fieber, 1848)
VC61, VC62, VC63, VC64, VC65: frequent, in reed beds, 1944-2020.

Sigara (Subsigara) falleni (Fieber, 1848)
VC61, VC62, VC63, VC64, VC65: frequent, lakes and rivers with sandy bottoms, 1947-2020.
Sigara (Subsigara) fossarum (Leach, 1817)
VC61, VC62, VC63, VC64, VC65: uncommon, lakes, rivers and ponds with thick vegetation, 1952-2020.
Sigara (Subsigara) scotti (Douglas & Scott, 1868)
VC61, VC62, VC63, VC65: scarce, heath and moorland shallow water, 1946-2012.
Sigara (Vermicorixa) lateralis (Leach, 1817)
VC61, VC62, VC63, VC64, VC65: frequent, in brackish ponds, 1929-2020.

Superfamily: NAUCOROIDEA Leach, 1815
Family: NAUCORIDAE Leach, 1815
Subfamily: NAUCORINAE Leach, 1815
Ilyocoris cimicoides cimicoides (Linnaeus, 1758)
VC61, VC62, VC63, VC64, VC65: frequent, in muddy ponds and stagnant water bodies, 1998-2020.
Family: APHELOCHEIRIDAE Fieber, 1851
Aphelocheirus aestivalis (Fabricius, 1794)
VC61, VC62: rare, in moderately fast rivers and streams with stony or gravely bottoms, 1937-1973.

Superfamily: NOTONECTOIDEA Latreille, 1802
Family: NOTONECTIDAE Latreille, 1802
Subfamily: NOTONECTINAE Latreille, 1802
Tribe: NOTONECTINI Latreille, 1802
Notonecta glauca glauca Linnaeus, 1758
VC61, VC62, VC63, VC64, VC65: common, in ponds canals and ditches, 1933-2020.

Notonecta maculata Fabricius, 1794

VC61, VC62, VC63, VC64, VC65: uncommon, in barren concrete lined or stony bottomed water bodies, 1945-2020.

Notonecta obliqua Thunberg, 1787

VC61, VC62, VC63, VC64, VC65: uncommon, acid or bog pools, 1941-2018.

Notonecta viridis Delcourt, 1909

VC61, VC62, VC63, VC64, VC65: uncommon, brackish pools and ditches, 1951-2020.

Superfamily: PLEOIDEA Fieber, 1851

Family: PLEIDAE Fieber, 1851

Plea minutissima minutissima Leach, 1817

VC61, VC62, VC63, VC64, VC65: frequent, relatively still water bodies with dense beds of Hornwort, Water Crowfoot, or Water Milfoil, 1933-2020.

Infraorder: Gerromorpha

Superfamily: MESOVELIOIDEA Douglas & Scott, 1867

Family: MESOVELIIDAE Douglas & Scott, 1867

Subfamily: MESOVELIINAE Douglas & Scott, 1867

Mesovelia furcata Mulsant & Rey, 1852

VC61, VC62, VC63, VC64: scarce, on leaves of Curled Pondweed, 1983-2020.

Superfamily: HEBROIDEA Amyot & Serville, 1843

Family: HEBRIDAE Amyot & Serville, 1843

Subfamily: HEBRIDAE Amyot & Serville, 1843

Hebrus (Hebrusella) ruficeps Thomson, 1871

VC61, VC62, VC64: rare, in Sphagnum moss, 1967-2018.

Superfamily: HYDROMETROIDEA Billberg, 1820

Family: HYDROMETRIDAE Billberg, 1820

Subfamily: HYDROMETRINAE Billberg, 1820

Hydrometra stagnorum (Linnaeus, 1758)

VC61, VC62, VC63, VC64, VC65: frequent, reedy margins of water bodies, 1952-2019.

Superfamily: GERROIDEA Leach, 1815

Family: VELIIDAE Brullé, 1836

Subfamily: MICROVELIINAE China & Usinger, 1949 (1860)

Tribe: MICROVELIINI China & Usinger, 1949 (1861)

Microvelia pygmaea (Dufour, 1833)

VC63, VC64: rare,single record, J.M. Brown, on sheltered canals and lakes, 1935?.

Microvelia reticulata (Burmeister, 1835)

VC61, VC62, VC63, VC64, VC65: frequent, on still water surface amongst emergent vegetation, 1952-2020.

Tribe: VELIINAE Brullé, 1936

Velia (Plesiovelia) caprai caprai Tamanini, 1947

VC61, VC62, VC63, VC64, VC65: common, on clear weed-free water with low organic matter, 1928-2018.

Velia (Plesiovelia) saulii Tamanini, 1947

VC63, VC64, VC65: scarce, on larger water bodies than previous species, 1953-1988.

Family: GERRIDAE Leach, 1815

Subfamily: GERRINAE Leach, 1815
Tribe: GERRINI Leach, 1815

Aquarius najas (DeGeer, 1773)

VC63, VC64: rare, on margins of lakes, rivers and large streams, based on pre 1921 records.

Gerris (Gerriselloides) lateralis Schummel, 1832

VC61, VC62, VC63, VC64: scarce, on still or stagnant water often with dense vegetation, 1952-2018.

Gerris argentatus Schummel, 1832

VC61, VC62, VC63, VC64: scarce, on brackish lowland water bodies with lots of vegetation, 1952-2012.

Gerris costae poissoni Wagner & Zimmerman, 1955

VC62, VC63, VC64, VC65: uncommon, on upland peat pools, 1933-2007.

Gerris gibbifer Schummel, 1832

VC62, VC63, VC64: scarce, lowland peat pools, 1933-2000.

Gerris lacustris (Linnaeus, 1758)

VC61, VC62, VC63, VC64, VC65: common, on ponds with high organic matter, 1947-2020.

Gerris odontogaster (Zetterstedt, 1828)

VC61, VC62, VC63, VC64: frequent, weedy and acidic water bodies, 1949-2020.

Gerris thoracicus Schummel, 1832

VC61, VC62, VC63, VC64, VC65: frequent, dew, silt and detritus water bodies, 1930-2018.

Infraorder: Leptopodomorpha
Superfamily: Saldoidea

Family: SALDIDAE Amyot & Serville, 1843
Subfamily: SALDINAE Amyot & Serville, 1843
Tribe: SALDOIDINI Reuter, 1912

Chartoscirta cincta cincta (Herrich-Schaeffer, 1841)

VC61, VC62, VC63, VC64: frequent, in reeds and rushes at the side of water bodies, 1938-2018.

Chartoscirta cocksii (Curtis, 1835)

VC62, VC63, VC64, VC65: scarce, in grass tussocks in bogs, 1961-2001.

Chartoscirta elegantula elegantula (Fallén, 1807)

VC63: rare, estuaries, marshes and fens, 1975-2013.

Macrosaldula scotica (Curtis, 1835)

VC62, VC63, VC64, VC65: uncommon, shingle on margins of fast streams, 1951-1997.

Micracanthia marginalis (Fallén, 1807)

VC63: rare, two records from heath, 1976-2017.

Saldula c-album (Fieber, 1859)

VC61, VC62, VC63, VC64, VC65: frequent, shingle on margins of rivers, 1929-2006.

Saldula fucicola (J. Sahlberg, 1870)

VC61, VC63: rare, 2 records from a fen and a marsh, 1990.

Saldula orthochila (Fieber, 1859)

VC61, VC62, VC63, VC64, VC65: uncommon, sandy heaths, fields and lawns, 1951-1991.

Saldula pallipes (Fabricius, 1794)

VC61, VC63, VC64: uncommon, pools and puddles on sandy clays and gravels, 1948-2015.

Saldula palustris (Douglas, 1874)

VC61: rare, salt marsh, 1952-2016.

Saldula pilosella pilosella (Thomson, 1871)

VC61, VC63, VC64: rare, salt marsh and fen, 1953-2005.

Saldula saltatoria (Linnaeus, 1758)

VC61, VC62, VC63, VC64, VC65: common, margins of ponds, ditches and streams, 1929-2020.

Tribe: SALDINI Amyot & Serville, 1843

Salda littoralis (Linnaeus, 1758)

VC61, VC62, VC63, VC64, VC65: scarce, margins of rivers, lakes and salt marsh, 1949-1986.

Salda morio Zetterstedt, 1838

VC62, VC63, VC64, VC65: scarce, mainly upland peat bogs, 1942-1995.

Salda muelleri (Gmelin, 1790)

VC62, VC63, VC64, VC65: scarce, mainly upland peat bogs, 1953-1992.

Teloleuca pellucens (Fabricius, 1799)

VC62, VC63, VC64, VC65: scarce, mainly upland peat bogs, 1955-1987.

Taxonomic Changes since Southwood & Leston (1959) and adopted herein:

Dipsocoromorpha:

Ceratocombus coleoptrata (Zetterstedt) is now *Ceratocombus coleoptratus* (Zetterstedt, 1819)

Nepomorpha:

Notonecta marmorea Fabricius is now *Notonecta viridis* Delcourt, 1909

Plea atomaria (Pallas) is now *Plea minutissima minutissima* Leach, 1817

Cymatia bansdorffi (Sahlberg) is now *Cymatia bansdorffi* (C.R. Sahlberg, 1819)

Hesperocorixa linnei (Fieber) is now *Hesperocorixa linnaei* (Fieber, 1848)

Sigara (Vermicorixa) concinna (Fieber) is now *Paracorixa concinna concinna* (Fieber, 1848)

Gerromorpha:

Gerris costai (Herrich-Scaeffer) is now *Gerris costae poissoni* Wagner & Zimmerman, 1955

Leptopodomorpha:

Chartoscirta cocksi (Curtis) is now *Chartoscirta cocksii* (Curtis, 1835)

Saldula scotica (Curtis) is now *Macrosaldula scotica* (Curtis, 1835)

Saldula vestita (Douglas) is now *Saldula fucicola* (J. Sahlberg, 1870)

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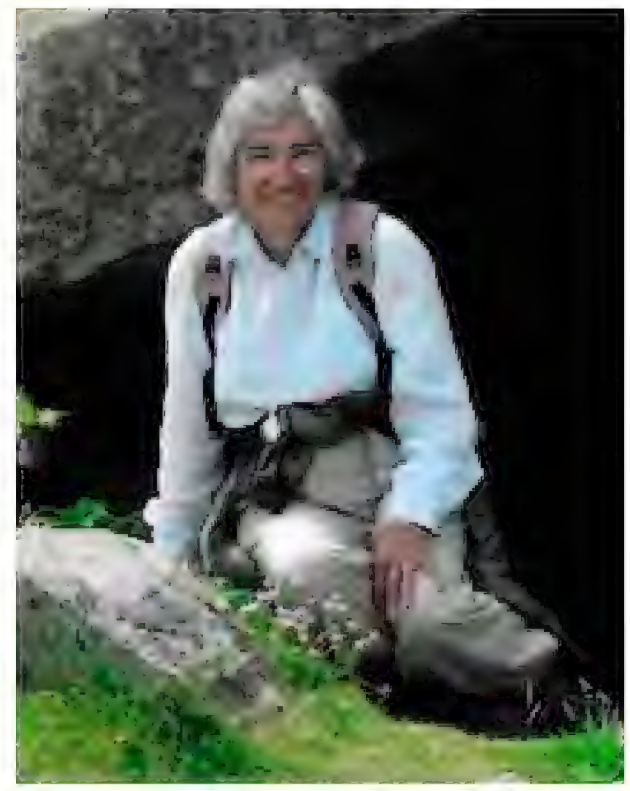
A list of some British species and selected photographs can be viewed at:
https://www.britishbugs.org.uk/gallery.html
https://aquaticbugs.com
Informative articles on British Heteroptera have been published in Het News, available at:
https://www.britishbugs.org.uk/HetNews.html

Obituary: Phyl Abbott 1936 –2021

Born Phyllis Patricia Rockley in Newton, Derbyshire, to Lily and John (known as Jack) Rockley, Phyl spent her early life in Teversal, North Nottinghamshire, close to Silverhill Colliery, where her father worked as a miner. The house backed on to open fields which Phyl loved to wander over as a young girl where she must have delighted in the diversity of wildflowers at a time before the growth of intensive agriculture took its toll. This early close encounter must have played a part in her developing botanical interests.

Phyl attended Teversal Primary School and then, after passing the 11-plus, Brunts Grammar School, Mansfield, where she met Cedric Abbott. She was persuaded by a teacher there that, with her aptitude for languages, she should consider going to university and so, while Cedric went to Birmingham University to study medicine, Phyl went to Sheffield where she gained a 1st Class Honours degree in French, after also studying German and Latin, the latter proving very useful as Phyl's botanical activities increased! After graduating in 1958 she went to Birmingham to study for a Post-graduate Certificate in Education and then taught French at Rowley Regis Grammar School. She married Cedric in 1959. When he joined the Pathology Department at Leeds General Infirmary in 1963 they moved to Cookridge, North Leeds, with easy access to fields and woods for further botanising. In 1970, when Phyl's daughter Jackie and son Mike were old enough, she returned to teaching in Leeds, eventually retiring from the profession in 1991.



Phyl botanising in Dolmen, Pembrokeshire, 2009.
Photo: Cedric Abbott

In 1972 Phyl joined Leeds Naturalists' Club and was soon afterwards made President and, after that, Secretary, a role she fulfilled from 1978 to 1991. Also in the 1970s, she joined the Wild Flower Society (WFS), the Botanical Society of the British Isles, The Swarthmore Botany Club, The Bradford Botany Group, the YNU and several other relevant conservation organisations. Phyl's first WFS Field Botanist's diary, for 1972-73, records wildflowers from around Leeds, Nottinghamshire and Derbyshire, near her parents' house, locations in the Yorkshire Dales, and from family holidays wider afield. It also contains a letter from a Barbara Garratt, who oversaw the diaries, and which made reference to the Lady's Slipper Orchid *Cypripedium calceolus*, indicating Phyl's early involvement with the very secretive project to conserve and reintroduce this species to its former sites. In 1974 Phyl's WFS diary recorded 796 species and contained a letter from Mrs Garratt congratulating her for getting into Valhalla (!), an exclusive group within the WFS, entry to which is granted on the basis of the number and quality of species' records.

Through living in Leeds and, in particular, membership of Leeds Naturalists' Club, which was then well supported by academics from Leeds University, Phyl benefitted greatly from a number of natural history mentors, including Drs Nelson and Sledge from the University, Mrs Houseman, Miss Kilby from the Swarthmoor Botany Club and Adrian Norris and John Armitage from Leeds Museum.

It is probably true to say that Phyl's heart was never wholly into teaching French and she was far happier botanising. By the time she retired from teaching her botanical knowledge and reputation had grown to the extent that she was offered a number of professional botanical survey contracts, particularly during the 1990s. These included land in Upper Wharfedale and Langstrothdale for the National Trust, potential Natural Heritage Sites in Barnsley District, a Phase 1 habitat survey for Harrogate District, rare canal plants of north-west England, drains of Hatfield Chase, a Phase 1 survey of Potteric Carr environs in 1995, an ecological survey of Saxton Cross, Tingley, and, for English Nature, surveys of Thistle Broomrape *Orobanche reticulata* in West and East Yorkshire. Complementing this, in 1996 Phyl became YNU Botanical Recorder for VC 64, Mid-west Yorkshire, a role she continued in until 2018.

During the early 1980s Phyl had perceived a gap in the local botanical literature since, although floras focusing on Leeds and Harrogate had been published in 1963 and 1978 respectively, nothing had been published on the whole of the West Riding since 1888! Consequently, each time she went out, Phyl recorded every species she saw, using tetrads (2km x 2km squares) as the recording unit, with the ultimate aim of publishing a plant atlas for VC64. She originally envisaged that the project would take about five years. Despite the assistance of other volunteer botanists, the *Plant Atlas of Mid-west Yorkshire,* Phyl's *magnum opus*, took rather longer than anticipated, as is so often the case (she claimed four times as long), and was not ready for publishing by the YNU until 2005! It is clear from the introduction to the *Atlas* that details the long list of individuals and organisations that have contributed to it that this was a mammoth task, not only of recording plants but also collaborating with a very large number of people, both of which were executed superbly by Phyl. The *Atlas* is described as filling 'a huge gap in our knowledge of one of the prime botanical regions of the British Isles' (Wilmore, 2006). Phyl also wrote for botanical bulletins, as well as authoring and co-authoring scholarly articles for *The Naturalist* and regularly giving talks to a variety of organisations.

The year after the Atlas was published, Phyl, very deservedly, was made President of the YNU

for 2006-07. At the end of her term of office she delivered her Presidential Address entitled *Rare plants in Mid-west Yorkshire: why are they only on limestone?* (Abbott, 2008).

Phyl was a quiet, unassuming, very reliable person who worked tirelessly and determinedly at everything she did. She participated actively in the many organisations she belonged to and made a major contribution to our knowledge of Yorkshire's flora and its distribution. She remained active up until 2019, when, on a holiday with her brother, Howard, and sister-in-law Marion, in South Africa, one of Phyl's favourite overseas botanical hunting grounds, she was still able to ascend a rickety ladder in search of plants. In November of the same year, she suffered a stroke which very sadly curtailed her activities and affected her ability to remember plant names, which before then, had been encyclopaedic. It transpired in a hospital admission for (non-covid) pneumonia in February 2021 that the gradually deteriorating shortness of breath Phyl had been experiencing for a couple of years was due to pulmonary fibrosis, the same condition to which fellow YNU botanist and friend, Geoffrey Wilmore, succumbed in 2018. The pneumonia severely exacerbated her existing condition and Phyl died peacefully in her sleep in a Lichfield nursing home with Jackie and Mike at her side.

Andy Millard

References

Abbott, P.P. (2008). Rare plants in Mid-west Yorkshire: why are they only on limestone? *The Naturalist* 133: 3-8.

Wilmore, G.T.D. (2006). Review of *Plant Atlas of Mid-west Yorkshire*. *The Naturalist* 131: 154-155.

Book Review

Who Discovered The Teesdale Rarities? by **Frank Horsman.** (Self-published by the author, 2021. 153pp, not illustrated.) £19 + p/p from the author (frankhorsman306@gmail.com).

Teesdale will be loved for many reasons, but the one which carries its name furthest afield is its wild flowers. Teesdale's flora is an extraordinary knot of rare and beautiful species, of a complexity and wonder far greater than chance alone would permit. Frank Horsman's book shines a light on how this extraordinary fact came to light. Others have written on the underlying climatic and geological reasons, but Dr Horsman seeks to explain the early dawnings: who first stumbled on the treasure – or indeed tracked it down – and how the news spread, took hold, and came to occupy the public imagination.

I own that the question posed by the title seemed at first to miss the point (the point being that the Teesdale rarities are right now more threatened than ever before in their ten-thousand year history, and I am not drawn by the colours of the deck-chairs on the Titanic). But the intense studiousness of the work quickly forced the realisation that its title is a legitimate question, one which has clearly exercised a great deal of the author's time in this accessible version of a PhD thesis submitted some twenty years ago. Roy Clapham, famous Professor of Botany at the University of Sheffield, had written in 1978 that "The story of these years of discovery is, it must be admitted, very imperfectly known". Not now it isn't. Leafing through this book one is left in no doubt that the story is now as well-documented as it is ever likely to be. And the

truth is surprising.

It is a story which would effortlessly top the viewing ratings were it ever to come to the attention of a scriptwriter. It involves the great and the lowly, intrigue and diplomacy. The action is divided between the most beautiful and dramatic scenic backdrop England has to offer and the heart of the capital where the seminal *English Botany* is being engraved by James Sowerby (whose Wikipedia image, incidentally, turns out to be conveniently handsome). Post-carriages repeatedly clatter through the mud as parcels of specimens are urgently ferried from the former to the latter. The topic? Our embattled biodiversity. The chief protagonist is a completely overlooked real-life hero, colourful by virtue of being a surgeon-apothecarist, and there is the underhandedness of a man of the cloth thrown in for good measure. And all this in late eighteenth century costume. We should be immensely grateful to Dr Horsman for drawing it to our attention.

Be aware, though, that this *is* a self-published PhD thesis, an in-depth investigation into a highly specialised topic area intended for a specialist readership. Though gripped by the concept and familiar with the plants, in spite of many re-readings of the text I repeatedly failed to find a narrative thread strong enough to pull me along. This was partly because of the sheer volume of material, but also on account of the style, with a profusion of indented quotes, footnotes, font changes, bracketing and specialist references. This is a shame, as there are many real gems buried therein. Helpfully though, Dr Horsman sets out his key questions in a manageable introduction, and answers them in an equally convenient and welcome conclusion, which in itself merits the book's purchase price. Gwynn Ellis's herculanean index is equally indispensable, although it appears that a production error late in the day has shifted pagination back by one page from that referenced, at least for some of the inclusions. Another inevitable disappointment is the frequent reference to plates, which have to be accessed via the University of Durham's E-thesis webpages. Perfectly straightforward for most – but not all – and had even a selection of these been included they would of course have leavened the text greatly. This and other problems for a non-specialist reader, such as maintaining mental images of at least ten protagonists, are mostly answerable by the fact that this was never intended to be a normal book for a normal readership. One definite omission, it seems to me however, is a summary table by species, which shows which species were (probably) discovered by whom and when, with short notes as to why others may have stolen the limelight.

The chapters of the book are grounded on a sequence of biographies of the main players in the drama, some better-known than others. These contain much of interest, such as the links between plant-hunting and medicine, the extraordinary phenomenon of 'plant exchange', and the birth of the field flora, something so basic to field study nowadays that we tend to assume they have been around forever. How would you go about identifying an unknown plant in a world with neither field guides nor the internet?

This book will be of interest to local naturalists and social historians, and those curious enough to ponder the practice of the early days of field botany in the British Isles. It may also be the investment of a lifetime for a patient and well-connected scriptwriter.

Stuart Hedley (BSBI botanical recorder for Herefordshire; formerly worked in Teesdale)

YNU Calendar

The face-to-face meetings detailed below (including the AGM) will be subject to the Covid-19 situation. Visit www.ynu.org.uk for updates on this.

YNU Annual General Meeting

Saturday 9 October 2021 at **St John's Methodist Church Hall, Settle** BD24 9JH. 1.30pm to 4.30pm**.** The AGM will be hosted by Craven Conservation Group and followed by a presidential address by **Dr Judith Allinson**.

It will be preceded in the morning by a programme of workshops and displays and the opportunity for a meeting of the Natural Sciences Forum.

For more information and booking visit www.ynu.org.uk/AGM

Section meetings

Sept	11	YNU Executive. Meet in the Lounge at St.Chad's Parish Centre, Leeds. 10:30 to 12:30. TBC.
Oct	2	Bryological Section meeting at Scoska Wood and Brown Scar, Littondale VC64. Meet at 10am in Arncliffe, near the Falcon Inn SD931718. Contact: Tom Blockeel tblockeel@aol.com
	9	**YNU Annual General Meeting - see above**
	16	Entomological Section AGM at Potteric Carr NR Education Centre, 11am to 12:30; open to the public. Exhibits 1:30 to 4:30

Evening Themed Zoom Meetings

Booking to attend these will be via the website and/or emails sent to members and representatives of affiliated societies. It is hoped to arrange further themed Zoom meetings early in 2022 and anyone interested in leading one should contact a member of the Executive. Sessions start at 7.30pm.

Sep	16	The Natural History of Blackmoorfoot Reservoir. Mike Denton
Oct	14	The State of Yorkshire's Nature. Alastair Fitter
Nov	11	The ascent of RAM: A history of technology in biological recording. Clare Langrick & Mark Wills
In addition to these visit http://bit.ly/ynu-zoom-chat for details of the YNU Friday evening Chat sessions.		

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The Naturalist

Notice to contributors

Contributors should indicate whether they wish their manuscripts to be subjected to anonymous peer review. All other manuscripts will be reviewed by the Editorial Board who at their discretion may send them to third parties for comment and advice.

Original articles should be submitted electronically as an MS Word document to Dr A. Millard at:

editor@ynu.org.uk

Please look at a recent issue of the journal for a general idea of how to present your article. Also see *The Naturalist* - *Guidance for authors* at www.ynu.org.uk/naturalist and please **avoid** the following:

- using any paragraph formatting and line spacings other than single.
- using tabs to tabulate information (please use MS Word table format).
- inserting any figures, graphs or plates into the text; indicate their proposed locations in the text and send them as separate files.

Good quality, high resolution images are very welcome and should be sent as .jpg files, with a separate MS Word file containing the caption and name of the person to whom the image should be attributed.

If electronic submission is not possible, contributions should be sent to Dr. A. Millard, Woodland Villas, 86 Bachelor Lane, Horsforth, Leeds LS18 5NF (Tel. 0113 258 2482).

Contributors should ensure the accuracy of reference citations. The Editorial Board and Council accept no responsibility for opinions expressed by contributors.

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